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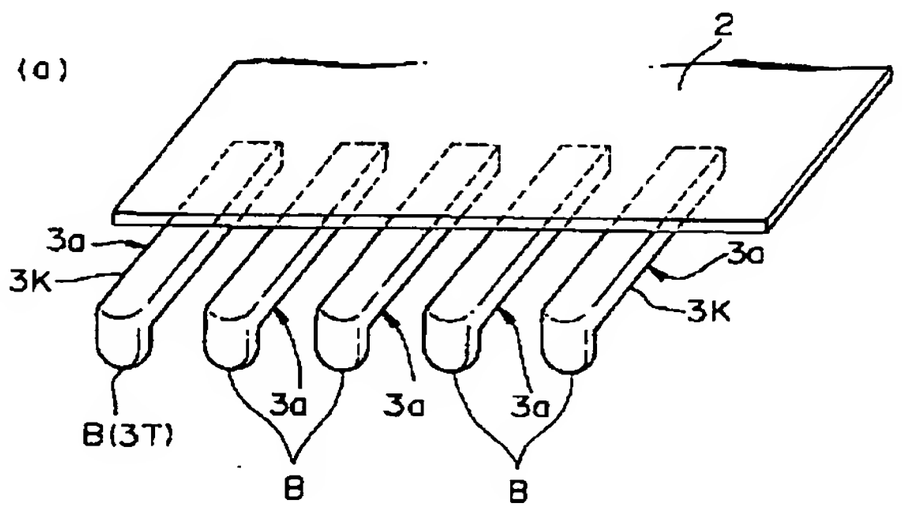
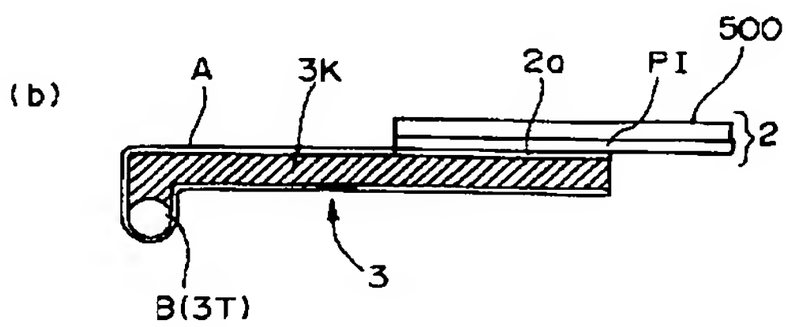
(54)【発明の名称】　コンタクトプローブおよびその製造方法、並びにコンタクトプローブを備えたプローブ装置

(57)【要約】
【課題】　各コンタクトピンの先端を研磨することなく高さを均一に揃えて、各コンタクトピンが同時にパッドに接触して、接触精度を向上させる。
【解決手段】　マスク露光技術を用いて、コンタクトピン３ａをその先端部（本例ではタングステン製のボール）３Ｔが本体部３Ｋより下方へ垂直に突出した状態で一体成形するので、各先端部３Ｔの寸法を高精度にして各先端部３Ｔの高さを揃えることができ、従来のような研磨が不要になる。パッドが例えば軟質な金により形成されている場合、コンタクトプローブをパッド面に対して平行に配設し、オーバードライブをかけるだけで、前記先端部３Ｔがパッド表面の酸化膜のみを除去し、パッドの下地に確実に接触する。ピンの先端を研磨する必要がない上に、コンタクトプローブを傾斜配置させる必要もなく、従来に比べて、コンタクトプローブを組み込むための部品や治具等の構造が単純化される。





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【特許請求の範囲】

【請求項１】　複数のパターン配線（３）がフィルム（２，２０１，２０１ａ）上に形成されこれらのパターン配線（３）の各先端が前記フィルム（２，２０１，２０１ａ）から突出状態に配されてコンタクトピン（３ａ）とされるコンタクトプローブ（１，２００）であって、

前記コンタクトピン（３ａ）は、その本体部（３Ｋ）に対して先端部（３Ｔ）が下方へ垂直に突出した状態で一体成形されたものであり、かつ前記先端部（３Ｔ）は前記本体部（３Ｋ）よりも硬くかつ導電性の材料で形成されていることを特徴とするコンタクトプローブ。

【請求項２】　前記先端部（３Ｔ）はその下端に向けて断面積が漸次小さくなる形状とされている請求項１に記載のコンタクトプローブ。

【請求項３】　前記先端部（３Ｔ）にタングステン製のボールまたは針を含む請求項１または請求項２に記載のコンタクトプローブ。

【請求項４】　前記フィルム（２，２０１，２０１ａ）には、金属フィルム（５００）が直接張り付けられて設けられている請求項１乃至請求項３のいずれか１項に記載のコンタクトプローブ。

【請求項５】　前記金属フィルム（５００）には、第２のフィルム（２０２）が直接張り付けられて設けられている請求項４に記載のコンタクトプローブ。

【請求項６】　基板層（５）の上に、コンタクトピン（３ａ）の先端部（３Ｔ）に被着又は結合する材質からなる第１の金属層（６）を形成する金属層形成工程と、第１の金属層（６）の上に第１のマスク（７）を施して、この第１のマスク（７）に、前記コンタクトピン（３ａ）の先端部（３Ｔ）を挿入するための開口部（７ａ）を形成する第１のパターン形成工程と、

前記コンタクトピン（３ａ）の本体部（３Ｋ）よりも硬くかつ導電性の材料からなる先端部（３Ｔ）を前記開口部（７ａ）に挿入して、前記第１の金属層（６）に押付ける先端部挿入工程と、

第１の金属層（６）の上に第２のマスク（９）を施して、この第２のマスク（９）に、前記コンタクトピン（３ａ）の本体部（３Ｋ）を形成するための開口部（９ａ）を、その一端部が前記第１のマスク（７）の前記開口部（７ａ）に重なるように形成する第２のパターン形成工程と、

前記第１のマスク（７）の各開口部（７ａ）および第２のマスク（９）の各開口部（９ａ）に、コンタクトピン（３ａ）に供される第２の金属層（N_1，Ｎ）をメッキ処理により形成するメッキ処理工程と、

第２のマスク（９）を除いた第２の金属層（Ｎ）の上に前記コンタクトピン（３ａ）に供される部分以外をカバーするフィルム（２，２０１，２０１ａ）を被着する被着工程と、

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前記フィルム（２，２０１，２０１ａ）と前記第２の金属層（Ｎ）からなる部分から、前記基板層（５）と前記第１の金属層（６）と第１のマスク（７）からなる部分を分離する分離工程と、を備えていることを特徴とするコンタクトプローブの製造方法。

【請求項７】　前記先端部（３Ｔ）はボール（Ｂ）または針である請求項６に記載のコンタクトプローブの製造方法。

【請求項８】　前記第１のマスク（７）の各開口部（７ａ）に第２の金属層（N_1）を形成する工程を、前記先端部挿入工程後に行う請求項６または請求項７に記載のコンタクトプローブの製造方法。

【請求項９】　前記先端部（３Ｔ）の表面を予め粗く加工しておく請求項６乃至請求項８のいずれか１項に記載のコンタクトプローブの製造方法。

【請求項１０】　請求項１乃至請求項５のいずれか１項に記載のコンタクトプローブ（２００）をパターン配線（３）の各基端に接続される端子（３０１）を有する回路（３００）に接続してなるプローブ装置（１００）であって、

このプローブ装置（１００）は、前記フィルム（２０１，２０１ａ）上に配されて該フィルム（２０１，２０１ａ）から前記コンタクトピン（３ａ）よりも短く突出する強弾性フィルム（４００）と、

この強弾性フィルム（４００）と前記コンタクトプローブ（２００）とを挟持するコンタクトプローブ挟持体（１１０）とを備えていることを特徴とするプローブ装置。

【請求項１１】　請求項６乃至請求項９のいずれか１項に記載の製造方法により製造されたコンタクトプローブ（２００）をパターン配線（３）の各基端に接続される端子（３０１）を有する回路（３００）に接続してなるプローブ装置（１００）であって、

このプローブ装置（１００）は、前記フィルム（２０１，２０１ａ）上に配されて該フィルム（２０１，２０１ａ）から前記コンタクトピン（３ａ）よりも短く突出する強弾性フィルム（４００）と、

この強弾性フィルム（４００）と前記コンタクトプローブ（２００）とを挟持するコンタクトプローブ挟持体（１１０）とを備えていることを特徴とするプローブ装置。

【請求項１２】　請求項１０または請求項１１に記載のプローブ装置（１００）において、前記フィルム（２０１ａ）は、前記強弾性フィルム（４００）が前記コンタクトピン（３ａ）を押圧するときに緩衝材となるように前記強弾性フィルム（４００）よりも先端側に長く形成されていることを特徴とするプローブ装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、プローブピンやソ

ケットピン等として用いられ、半導体ＩＣチップや液晶デバイス等の各端子に接触して電気的なテストを行うコンタクトプローブの製造方法に関する。

【０００２】

【従来の技術】一般に、ＩＣチップやＬＳＩチップ等の半導体チップ又はＬＣＤ（液晶表示体）の各端子に接触させて電気的なテストを行うために、コンタクトピンが用いられている。近年、ＩＣチップ等の高集積化および微細化に伴って電極であるコンタクトパッドが狭ピッチ化されるとともに、コンタクトピンの多ピン狭ピッチ化が要望されている。しかしながら、コンタクトピンとして用いられていたタングステン針のコンタクトプローブでは、タングステン針の径の限界から多ピン狭ピッチへの対応が困難になっていた。

【０００３】これに対して、図２９に示すように、複数のパターン配線３が樹脂フィルム２上に形成されこれらのパターン配線３の各先端が前記樹脂フィルム２から突出状態に配されてコンタクトピン３ａとされるコンタクトプローブ１の技術が提案されている（例えば、特公平７－８２０２７号公報）。この技術例では、複数のパターン配線３の先端をコンタクトピン３ａとすることによって、多ピン狭ピッチ化を図るものである。

【０００４】一般に、Ａｌ（アルミニウム）合金等で形成されるＩＣチップ等の各端子（パッド）は、その表面が空気中で酸化して、アルミニウムの薄い表面酸化膜で覆われた状態となっている。そのため、パッドの電気テストを行うには、前記アルミニウムの表面酸化膜を剥離させ、内部のアルミニウムを露出させて、導電性を確保する必要がある。そこで、前記コンタクトプローブ１においては、コンタクトピン３ａをパッドの表面に接触させつつ、オーバードライブをかけることにより、コンタクトピン３ａの先端部でパッド表面のアルミニウムの表面酸化膜を擦り取り、内部のアルミニウムを露出させるようにしている。この作業は、スクラブ（scrub）と呼ばれる。

【０００５】ところで、前記コンタクトプローブ１の製造は、以下の工程を経て行われる。

①ステンレス板の上面に銅メッキを施す。

②この銅層にレジストマスク（マスク）を形成し、フォトマスクを介して露光・現像を行う。

③レジストマスクされていない部分にニッケルメッキを施して前記パターン配線３を形成する。

④このパターン配線３のうち、前記コンタクトピン３ａとされる先端部を除いた部分の上面に、前記樹脂フィルム２を被着させる。

⑤この樹脂フィルム２とパターン配線３と前記銅層とからなる部分と、前記ステンレス板とを分離させる。

⑥この樹脂フィルム２とパターン配線３とから部分から、前記銅層を除去して、前記コンタクトプローブ１を作製する。

【０００６】上記の製造方法によれば、前記コンタクトピン３ａの下面３ｂは、平坦に形成される。このため、前記コンタクトピン３ａを、その軸線がパッド面に対して平行となるように配設すると、オーバードライブしても、該パッド面と前記平坦な下面３ｂとが平行に当接するのみであり、アルミニウムの表面酸化膜を良好に擦り取ることができない。このことから、前記コンタクトピン３ａは、図３０に示すように、パッド面Ｐａに対して一定の接触角θを有するように傾斜して配設されていた。

【０００７】前記接触角θを保持しつつ前記コンタクトピン３ａを配設するには、前記コンタクトプローブ１を所定角θ傾斜させて組み込むための各種部品３０，５０や治具等が必要とされる。これらの各種部品３０，５０や治具等は、コンタクトプローブ１を傾斜させた状態で組み込む構成であるため、例えば、コンタクトプローブ１を単に水平に載置させるものに比べて構造が複雑となる。さらに、前記接触角θは、スクラブ時にスクラブ距離（パット表面に沿って皮膜を削り取る長さ）や深さに大きく影響を与え、該接触角θの如何によっては、スクラブ時にコンタクトピン３ａの先端部がパッドＰからはみ出してしまったり、パッドＰ自体を傷つけることから、前記部品３０，５０には、その接触角θの正確さを確保するに十分な精密さが要求され、加工が困難である。

【０００８】

【発明が解決しようとする課題】ところで、スクラブを行うに際しては、コンタクトピンがパッド表面のアルミニウムの表面酸化膜のみならず、その下のパッド自体（下地）まで傷つけてしまうことを防止する必要がある。スクラブ時にパッドの下地が傷つくのを防止するためには、コンタクトピンのパッドに対する接触角を十分な大きさまで確保することが必要とされる。というのは、接触角が小さいと、表面のアルミニウムの除去量が著しく大きくなり、パッド下地にまで影響を及ぼすという理由からである。そこで、図３１に示すように、治具（不図示）を使用して、コンタクトピン３ａの先端部３Ｔを接触面Ｐに対して略垂直になるように折り曲げることが検討されている。

【０００９】しかしながら、コンタクトピンの折り曲げた先端部の高さや間隔にはどうしてもばらつきがあるため、すなわちピン下端に不揃いが発生するために、チップやＬＳＩチップ等の半導体チップ又は液晶パネルの各端子に接触させる際に、導通していない状態が生じ、接触精度が悪い。また、オーバードライブ量を増加させると、特にパッドがアルミニウムと比較して軟質な材料（例えば金）により形成されている場合には、パッド下地に傷が付くという問題点がある。なお、コンタクトピンの先端を研磨により揃えることができるが、これには手間や長時間を要し、検査効率が低くなる。さらに、前

記コンタクトピンはその全体に亘って同一の材質により形成されているが、コンタクトピンの特に先端部が摩耗しやすく、この摩耗量が規定量を超えたら、コンタクトプローブ全体を交換しなければならず、ランニングコストが嵩むことにもなる。

【００１０】本発明は、上記の事情に鑑みてなされたもので、研磨が不要であるとともに、各コンタクトピンの先端の高さを揃えて、オーバードライブの際に各コンタクトピンが同時にパッドに接触して、接触精度が高く、かつコンタクトピンの先端部の摩耗を低減してランニングコストが低減するコンタクトプローブおよびその製造方法、並びにプローブ装置を提供することを目的としている。

【００１１】

【課題を解決するための手段】上記目的を達成するための本発明のコンタクトプローブは、複数のパターン配線がフィルム上に形成されこれらのパターン配線の各先端が前記フィルムから突出状態に配されてコンタクトピンとされるコンタクトプローブであって、前記コンタクトピンは、その本体部に対して先端部が下方へ垂直に突出した状態で一体成形されたものであり、かつ前記先端部は前記本体部よりも硬くかつ導電性の材料で形成されていることを特徴とするものである。また、前記先端部はその下端に向けて断面積が漸次小さくなる形状とされている。さらに、前記先端部はタングステン製のボールまたは針である。そして、前記フィルムには、金属フィルムが直接張り付けられて設けられているものや、前記金属フィルムには、第２のフィルムが直接張り付けられて設けられているものとすることができる。

【００１２】本発明のコンタクトプローブの製造方法は、基板層の上に、コンタクトピンの先端部に被着又は結合する材質からなる第１の金属層を形成する金属層形成工程と、第１の金属層の上に第１のマスクを施して、この第１のマスクに、前記コンタクトピンの先端部を挿入するための開口部を形成する第１のパターン形成工程と、　前記コンタクトピンの本体部よりも硬くかつ導電性の材料からなる先端部を前記開口部に挿入して、前記第１の金属層に押付ける先端部挿入工程と、第１の金属層の上に第２のマスクを施して、この第２のマスクに、前記コンタクトピンの本体部を形成するための開口部を、その一端部が前記第１のマスクの前記開口部に重なるように形成する第２のパターン形成工程と、前記第１のマスクの各開口部および第２のマスクの各開口部に、コンタクトピンに供される第２の金属層をメッキ処理により形成するメッキ処理工程と、第２のマスクを除いた第２の金属層の上に前記コンタクトピンに供される部分以外をカバーするフィルムを被着する被着工程と、前記フィルムと前記第２の金属層からなる部分から、前記基板層と前記第１の金属層と第１のマスクからなる部分を分離する分離工程と、を備えていることを特徴とするものである。また、前記先端部はボールまたは針である。さらに、前記第１のマスクの各開口部に第２の金属層を形成する工程を、前記先端部挿入工程後に行ってもよい。そして、前記ボールまたは針の表面を予め粗く加工しておく。

【００１３】本発明のプローブ装置は、上記コンタクトプローブをパターン配線の各基端に接続される端子を有する回路に接続してなるプローブ装置であって、このプローブ装置は、前記フィルム上に配されて該フィルムから前記コンタクトピンよりも短く突出する強弾性フィルムと、この強弾性フィルムと前記コンタクトプローブとを挟持するコンタクトプローブ挟持体とを備えていることを特徴とするものである。また、前記フィルムは、前記強弾性フィルムが前記コンタクトピンを押圧するときに緩衝材となるように前記強弾性フィルムよりも先端側に長く形成されている。

【００１４】本発明の作用としては、例えばマスク露光技術を用いて、コンタクトピンをその先端部が本体部の下面より垂直に突出した状態で一体成形するので、従来のような折り曲げ加工を行わず、各コンタクトピンの先端部の寸法を高精度にして、先端部の高さを均一に揃えることができ、従来のような研磨が不要になる。また、パッドがアルミニウムよりも軟質な材料（例えば金）により形成されている場合、コンタクトピンをパッド面に対して平行に配設しても、スクラブを行わずに、オーバードライブをかけるだけで、各コンタクトピンの先端部の下面がパッドの酸化膜のみを取り除き、下地に傷を付けることなく確実に接触する。このように、コンタクトプローブを傾斜配置させる必要がないことから、従来に比べて、コンタクトプローブを組み込むための部品や治具等の構造が単純化され、加工が容易となる。さらに、コンタクトピンの先端部は本体部よりも硬い材料により形成されているので、この先端部の耐摩耗性が向上して、コンタクトピン全体の寿命が延びるとともに、パッドに食い込みやすくなる。そして、前記先端部はその下端に向けて断面積が漸次小さくなる形状とされているので、例えばコンタクトピンをパッド面に対して平行に配設した場合であっても、オーバードライブ時に前記先端部は、局部的針圧が高く、パッドに対して食いつき易く、その結果、アルミニウムの表面酸化膜を良好に破ることができる。

【００１５】本発明の製造方法により作製されたコンタクトプローブは、コンタクトピンをパッド面に対して平行に配設可能であるため、フィルム先端部から各パッドまでの距離が異なるパッド群に対しても、フィルム先端部からの各コンタクトピンの突出量をそれぞれのパッド距離に応じて変えて形成することにより、全てのパッドに対応することができる。しかも、その場合、各コンタクトピンの各パッドに対する接触角を同一にすることができる。

【００１６】このコンタクトプローブでは、前記フィルムが、例えば水分を吸収して伸張し易い樹脂フィルム等であっても、該フィルムには、金属フィルムが直接張り付けられて設けられているため、該金属フィルムにより前記フィルムの伸びが抑制される。したがって、フィルムの伸びによってコンタクトピンのピッチがずれることがなく、各パッドとの確実なコンタクトをとることができる。

【００１７】このコンタクトプローブでは、前記金属フィルムに第２のフィルムが直接張り付けられて設けられているため、各種部品によるコンタクトプローブの組み込み時の締付けに対して緩衝材となるという作用効果が得られる。したがって、組み込み時に配線パターンに与えるダメージを軽減させることができる。また、ＬＣＤ用のものにあっては、金属フィルムとＴＡＢＩＣの端子とのショートを防止することができる。

【００１８】このプローブ装置では、前記強弾性フィルムが設けられ、該強弾性フィルムがコンタクトピンの先端を上方から押さえるため、ピン先端が上方に湾曲したものが存在しても、パッドに確実に接触させることができ、各ピンに均一な接触圧が得られるところから接触不良による測定ミスをなくすことができる。この場合、前記凸部を形成したコンタクトピンを、例えばパッド面に対して平行に配設した場合には該コンタクトピンとパッド面との間に角度が無い分、特に、前記ピン先端が上方に湾曲したものが存在していると、オーバードライブしてもコンタクトが不確実となることが考えられるが、本プローブ装置では、その危惧がない。

【００１９】前記フィルムが前記強弾性フィルムよりも先端側に長く形成されて該強弾性フィルムがコンタクトピンを押圧するときに緩衝材となるため、繰り返しオーバードライブをかけても、強弾性フィルムとの摩擦によりコンタクトピンが歪んで湾曲すること等がなく、パッドに対して安定した接触を保つことができる。この場合、コンタクトピンを、例えばパッド面に対して平行に配設した場合には該コンタクトピンとパッド面との間に角度が無い分、特に、前記ピンに湾曲したもの等が存在していると、オーバードライブしてもコンタクトが不確実となることが考えられるが、本プローブ装置では、その危惧がない。

【００２０】

【発明の実施の形態】次に、本発明の実施例について図面を参照して説明する。以下、本発明に係るコンタクトプローブの製造方法の第１の実施形態を図１乃至図１３を参照しながら説明する。

【００２１】本実施形態のコンタクトプローブ１の基本構成は、前記図２９に示したとおり、ポリイミド樹脂フィルム２の片面に金属で形成されるパターン配線３を張り付けた構造となっており、前記樹脂フィルム２の端部から前記パターン配線３の先端が突出してコンタクトピン３ａとされている。ここで、本実施形態の特徴は、図９に示すように、コンタクトピン３ａの先端部（本例ではタングステン製のボール）３Ｔが本体部３Ｋに対して下方へ垂直に突出している点である。

【００２２】次に、図１乃至図９を参照して、前記コンタクトプローブ１の作製工程について工程順に説明する。

【００２３】〔支持金属板および金属層形成工程〕先ず、図１に示すように、ステンレス製の支持金属板（基板層）５上に、Ｃｕ（銅）メッキによりベースメタル層（第１の金属層）６を形成する。このベースメタル層６は、支持金属板５の上面に均一の厚さで形成する。

【００２４】〔第１のパターン形成工程、第１の露光工程〕次に、このベースメタル層６の上に、第１のフォトレジスト層（第１のマスク）７を形成した後、写真製版技術を用いて、第１のフォトレジスト層７上に、光を透過させない部分８ａを複数有する所定のパターンの第１のフォトマスク８を施す。これら光を透過させない部分８ａ（図１では５つ図示されているが、これに限らない）は等間隔に配置され、コンタクトピン３ａの先端部３Ｔを形成するためのものである。

【００２５】ここで、露光し、図２に示すように、第１のフォトレジスト層７を現像し、第１のフォトレジスト層７の、光を透過させない部分８ａで覆われている部分に開口部７ａをそれぞれ形成する。この後、第１のフォトマスク８を除去する。

【００２６】本実施形態においては、第１のフォトレジスト層７をネガ型フォトレジストによって形成しているが、ポジ型フォトレジストを採用して所望の開口部７ａを形成しても構わない。また、本実施形態においては、前記第１のフォトレジスト層７が、本願請求項にいう「第１のマスク」に相当する。但し、本願請求項の「第１のマスク」とは、本実施形態の第１のフォトレジスト層７のように、第１のフォトマスク８を用いた露光・現像工程を経て開口部７ａが形成されるものに限定されるわけではない。例えば、メッキ処理される箇所に予め孔が形成された（すなわち、予め、図２の符号７で示す状態に形成されている）フィルム等でもよい。本願請求項において、このようなフィルム等を「第１のマスク」として用いる場合には、本実施形態におけるパターン形成工程は不要である。後述する第２のマスク９についても同様である。この開口部７ａを形成する位置は、その後の工程でＮｉまたはＮｉ合金層Ｎ（第２の金属層）により形成されるコンタクトピン３ａの、パッド（測定対象物）Ｐに対する先端部（接触部）３Ｔに相当する位置とする。

【００２７】〔先端部挿入工程〕そして、図３（ａ）に示すように、Ｃｕハーフエッチングを行うことにより、ベースメタル層６の、第１のフォトレジスト層７の開口部７ａと対応する部分を一部除去して、凹部６ａを形成

する。図３（ｂ）に示すように、タングステン製のボールＢを各開口部７ａに挿入して、前記凹部６ａに押付ける。このボールＢの大きさは開口部７ａにきつく嵌めるように設定され、表面が粗くなっている。ボールＢの材質はタングステンに限らず、コンタクトピン３ａの本体部３Ｋの材質よりも硬く（摩耗度が小さい）かつ導電性の材料であればよい。図３（ｃ）に示すように、各開口部７ａに、コンタクトピン３ａに供される第２の金属層N_1をメッキ処理により形成する。ここで、第２の金属層N_1はボールＢの下方に回り込むことはなく、また、前記ボールＢの表面粗さは粗く設定されているので、ボールＢはベースメタル層６に安定に支持されるとともに、ボールＢと第２の金属層N_1との接着強度は高い。なお、このメッキ処理工程は、後述する第２のフォトレジスト層９が本例のようにフィルムからなり、この第２のレジスト層９が開口部７ａ内に入り込まない場合には、必ずしも行わなくてもよい。また、図３（ｂ）のボール挿入工程を行う代わりに、図３（ｄ）に示すように、タングステン製の針Ｈをベースメタル層６に差し込み、これをコンタクトピンの先端部としてもよい。

【００２８】〔第２のパターン形成工程、第２の露光工程〕図４（ａ），（ｂ）に示すように、前記第１のフォトレジスト層７の上に第２のフォトレジスト層（第２のマスク）９を形成し、さらに、写真製版技術を用いて、第２のフォトレジスト層９上に、光を透過させない部分１０ａを複数有する所定のパターンの第２のフォトマスク１０ｂを施す。これら光を透過させない部分１０ａは、互いに等間隔で平行に延びており、コンタクトピン３ａの本体部３Ｋを形成するためのものである。なお、光を透過させない部分１０ａの一端部は前記第１のフォトレジスト層７の開口部７ａと重なる位置に形成されている。この後、露光することにより、図５（ａ），（ｂ）に示すように、第２のフォトレジスト層９の、前記光を透過させない部分１０ａで覆われている部分に開口部（溝）９ａをそれぞれ形成し、第２のフォトマスク１０ａを除去する。各開口部９はその一端部が第１のフォトレジスト層７の開口部７ａと重なる位置に形成されている。

【００２９】〔電解メッキ工程〕図６に示すように、第２のフォトレジスト層９の各開口部９ａに、コンタクトピン３ａに供される第２の金属層Ｎをメッキ処理により形成する。すなわち、各開口部９ａに前記パターン配線３となるＮｉまたはＮｉ合金層Ｎをメッキ処理により形成する。これにより、ＮｉまたはＮｉ合金層Ｎによりなるパターン配線３（コンタクトピン３ａ）は、その本体部３Ｋより先端部３Ｔ（ボールＢ）が下方へ垂直に突出して、この先端部３Ｔはパッドに対する接触部となる。その後、図７に示すように、第２のフォトレジスト層９を除去する。

【００３０】〔フィルム被着工程〕次に、図８に示すように、前記ＮｉまたはＮｉ合金層Ｎの上であって、図２９に示した前記パターン配線３の先端、すなわち、コンタクトピン３ａとなる部分以外に、前記樹脂フィルム２を接着剤２ａにより接着する。この樹脂フィルム２は、ポリイミド樹脂ＰＩに金属フィルム（銅箔）５００が一体に設けられた二層テープである。このフィルム被着工程の前までに、二層テープのうちの銅面５００に、銅エッチングの後、用途により金メッキを施して、グラウンド面を形成しておき、このフィルム被着工程では、二層テープのうちの樹脂面ＰＩを接着剤２ａを介して前記ＮｉまたはＮｉ合金層Ｎに被着させる。なお、金属フィルム５００は、銅箔に加えて、Ｎｉ、Ｎｉ合金等でもよい。

【００３１】〔分離工程〕そして、図９（ａ），（ｂ）に示すように、樹脂フィルム２とパターン配線３とベースメタル層６とからなる部分から、支持金属板５を分離させた後、Ｃｕエッチングを経て、樹脂フィルム２にパターン配線３のみを接着させた状態とする。

【００３２】〔金コーティング工程〕次に、露出状態のパターン配線３に、Ａｕメッキを施し、表面にＡｕメッキ層Ａを形成する。このとき、樹脂フィルム２から突出状態とされた前記コンタクトピン３ａでは、全周に亙る表面全体にＡｕ層Ａが形成される。

【００３３】以上の工程により、図１１および図１２に示すような、樹脂フィルム２にパターン配線３を接着させたコンタクトプローブ１が作製される。

【００３４】図１１は、前記コンタクトプローブ１をＩＣプローブとして所定形状に切り出したものを示す図であり、図１２は図１１のＣ－Ｃ線断面図である。図１１および図１２に示すように、樹脂フィルム２には、パターン配線３から得られた信号を引き出し用配線１０を介してプリント基板２０（図１０参照）に伝えるための窓１１が設けられている。

【００３５】図１２に示すように、前記金属フィルム５００は、コンタクトピン３ａの近傍まで設けられ、コンタクトピン３ａは、金属フィルム５００の先端部からの突出量Ｌが５ｍｍ以下とされている。この金属フィルム５００は、グラウンドとして用いることができ、それにより、プローブ装置（プローブカード）７０の先端近くまでインピーダンスマッチングをとる設計が可能となり、高周波域でのテストを行う場合にも反射雑音による悪影響を防ぐことができる。

【００３６】また、樹脂フィルム２（ポリイミド樹脂ＰＩ）に張り付けられた金属フィルム５００には、さらに以下の利点がある。すなわち、金属フィルム５００が無い場合、樹脂フィルム２は、ポリイミド樹脂からなっているため、水分を吸収して伸びが生じ、図１３に示すように、コンタクトピン３ａ，３ａ間の間隔ｔが変化することがあった。そのため、コンタクトピン３ａがパッドの所定位置に接触することができず、正確な電気テスト

を行うことができないという問題があった。本実施形態では、樹脂フィルム２に金属フィルム５００を張り付けることにより、湿度が変化しても前記間隔ｔの変化を少なくし、コンタクトピン３ａをパッドの所定位置に確実に接触させるようになっている。

【００３７】図１０に示すように、前記コンタクトピン３ａには、そのパッドに対する接触部に前記先端部３Ｔが形成されるため、例えば、コンタクトプローブ１をパッド面Ｐａに対して平行に配設した場合であっても、オーバードライブをかけるだけで、該先端部３ＴがパッドＰに対して確実に接触する。このことから、コンタクトプローブ１を傾斜配設させる必要があった従来に比べて、コンタクトプローブ１を組み込むための部品３１や治具等の構造が単純化され、加工が容易となる。具体的には、コンタクトプローブ１を例えば部品３１に接着させる等の単純な構成によっても、組み込むことが可能となる。

【００３８】上記のように構成されたプローブ装置７０を用いて、ＩＣチップのプローブテスト等を行う場合は、プローブ装置７０をプローバーに装着するとともにテスターに電気的に接続し、所定の電気信号をパターン配線３のコンタクトピン３ａからウェーハ上のＩＣチップに送ることによって、該ＩＣチップからの出力信号がコンタクトピン３ａから基板を通してテスターに伝送され、ＩＣチップの電気的特性が測定される。

【００３９】この場合、コンタクトピン３ａをその先端部３Ｔが本体部３Ｋの下面より垂直に突出状態で一体成形するので、各先端部３Ｔの寸法を高精度にして、各先端部３Ｔの高さを揃えることができ、従来のような手間や時間のかかる研磨が不要になる。また、コンタクトピン３ａの先端部３Ｔの高さや間隔が均一になるので、チップやＬＳＩチップ等の半導体チップ又は液晶パネルの各端子に接触させる際に、オーバードライブ量が少なくても、確実に導通して、接触精度が高い。さらに、パッドがアルミニウムよりも軟質な材料（例えば金）により形成されている場合、コンタクトピン３ａをパッド面に対して平行に配設しても、スクラブを行わずに、オーバードライブをかけるだけで、下地に傷を付けることなく確実に接触する。このように、コンタクトプローブを傾斜配置させる必要がないことから、従来に比べて、コンタクトプローブを組み込むための部品や治具等の構造が単純化され、加工が容易となる。そして、コンタクトプローブをパッド面に対して平行に配設しても、オーバードライブ量を増加させることにより、針圧を高くできて、パッドに対して食い込むため、良好なコンタクトを得ることができる。すなわち、パッドがアルミニウム等の比較的硬い材質で形成されている場合には、オーバードライブ時に針圧を高くすることにより、アルミニウムの酸化膜のみを除去することができる。コンタクトピン３ａの先端部３Ｔは本体部３Ｋよりも硬い材料（本例ではタングステン）により形成されているので、この先端部３Ｔの耐摩耗性が向上して、コンタクトピン３ａ全体の寿命が延びるとともに、パッドに食い込みやすくなる。前記先端部３Ｔはその下端に向けて断面積が漸次小さくなる形状とされているので、例えばコンタクトピン３ａをパッド面Ｐａに対して平行に配設した場合であっても、オーバードライブ時に前記先端部３Ｔは、局部的針圧が高く、パッドＰに対して食いつき易く、その結果、アルミニウムの表面酸化膜を良好に破ることができる。

【００４０】さらに、上記従来の製造方法により作製されたコンタクトプローブは、図３０に示すように、その下面３ｂが平坦であったため、良好なコンタクトを得るためにはスクラブが必要で、コンタクトピン３ａを傾斜させて配設する必要があったが、当該従来の、コンタクトピン３ａを斜め下方に突出させる構成によれば、フィルム先端部２ｋから各パッドＰまでの距離が等しく配列された（例えば平面視してフィルム先端部２ｋと平行な直線状に配列された）パッドＰ群には対応できるものの、フィルム先端部２ｋから各パッドＰ，Ｐ2までの距離が異なる（例えば平面視千鳥格子状に配列された）パッドＰ，Ｐ2群に対しては対応できなかった。

【００４１】というのは、コンタクトピン３ａはフィルム先端部２ｋからフィルム面２ｅに沿って（フィルム面２ｅと平行に）突出するため、フィルム２（コンタクトプローブ１）を傾斜させて配設する従来の構成においては、フィルム先端部２ｋから各パッドＰまでの距離が等しければ、各コンタクトピン３ａと各パッドＰとの接触角θを一定にできるが、前記距離が異なると、それらの全パッドＰ，Ｐ2‥に対して各コンタクトピン３ａ‥を接触させる構成は構造上困難であり、ましてやその場合に、各パッドＰ，Ｐ2‥との接触角θを一定に保つことはできないからである。

【００４２】これに対して、本実施形態の製造方法により作製されたコンタクトプローブ１は、図１０に示すように、コンタクトピン３ａをパッド面Ｐａに対して平行に配設可能であるため、フィルム先端部２ｋから各パッドＰ，Ｐ2までの距離が異なるパッドＰ，Ｐ2群に対しても、フィルム先端部２ｋからの各コンタクトピン３ａ，３ａ2の突出量をそれぞれのパッドＰ，Ｐ2距離に応じて変えて形成することにより、全てのパッドＰ，Ｐ2‥に対応することができる。しかも、その場合、各コンタクトピン３ａ，３ａ2の各パッドＰ，Ｐ2に対する接触角を同一（本実施形態では垂直）にすることができる。

【００４３】なお、第１の実施形態においては、コンタクトプローブ１をプローブカードであるプローブ装置７０に適用したが、他の測定用治具等に採用しても構わない。例えば、ＩＣチップを内側に保持して保護し、ＩＣチップのバーンインテスト用装置等に搭載されるＩＣチップテスト用ソケット等に適用してもよい。また、コン

タクトプローブを水平状態になるように配置したが、これに限らず、図３０および図３１に示したように斜めに配置して、スクラブを行ってもよい。

【００４４】次に、図１４乃至図１９を参照して、第２の実施形態について説明する。本実施形態は、第１の実施形態においてＩＣプローブ用の所定形状に切り出したコンタクトプローブ１（図１１参照）を、それに代えてＬＣＤ用プローブの所定形状に切り出して使用するものである。ＬＣＤ用プローブに切り出されたコンタクトプローブは、図１４乃至１６に符号２００で示され、符号２０１は樹脂フィルムである。

【００４５】図１７に示すように、ＬＣＤ用プローブ装置（プローブ装置）１００は、コンタクトプローブ挟持体１１０と、このコンタクトプローブ挟持体１１０を額縁状フレーム１２０に固定してなる構造を有しており（実際には複数個のコンタクトプローブ挟持体１１０が取り付けられるがここでは１つのみを図示した）、このコンタクトプローブ挟持体１１０から突出したコンタクトピン３ａの先端がＬＣＤ（液晶表示体）９０の端子（図示せず）に接触するようになっている。

【００４６】図１６に示すように、コンタクトプローブ挟持体１１０は、トップクランプ１１１とボトムクランプ１１５とを備えている。トップクランプ１１１は、コンタクトピン３ａの先端を押さえる第１の突起１１２、ドライバーＩＣであるＴＡＢＩＣ（回路）３００側の端子３０１を押さえる第２の突起１１３およびリードを押さえる第３の突起１１４を有している。

【００４７】コンタクトプローブ２００をボトムクランプ1･15の上に載置し、さらにＴＡＢＩＣ３００の端子３０１がコンタクトプローブ２００の樹脂フィルム２０１，２０１間に位置するように載置する。その後、トップクランプ１１１を第１の突起１１２が樹脂フィルム２０１の上でかつ第１の突起１１３が端子３０１に接触するように乗せボルトにより組み立てる。

【００４８】図１８に示すように、コンタクトプローブ２００を組み込み、ボルト１３０によりトップクランプ１１１とボトムクランプ１１５を組み合わせることにより、コンタクトプローブ挟持体１１０が作製される。

【００４９】ＬＣＤ用プローブ装置１００を用いたＬＣＤ９０の電気的テストは、ＬＣＤ用プローブ装置１００のコンタクトピン３ａの先端をＬＣＤ９０の端子（図示せず）に接触させた状態で、ＴＡＢＩＣ３００を駆動させて種々のテスト用信号を送り、該信号に反応してコンタクトピン３ａから得られた信号をＴＡＢＩＣ３００を通して外部に取り出すことにより行われる。なお、ＬＣＤ９０の場合は、ＯＮ－ＯＦＦのみがテストされるため、前記ＩＣのテストに比べて、高周波特性は特に問題とされない。

【００５０】上記ＬＣＤ用プローブ装置１００においても、例えば、図１９に示すように、コンタクトプローブ

２００をＬＣＤ９０の端子面に対して平行に配設した場合であっても、オーバードライブをかけるだけで、先端部３Ｔが端子に対して確実に接触する。このことから、従来に比べて、コンタクトプローブ２００を組み込むための部品（例えば、ボトムクランプ１１５）や治具等の構造が単純化され、加工が容易となる。コンタクトプローブ２００を組み込むに際しては、例えば部品（例えば、トップクランプ１１１）に接着させる等の単純な構成で行うことが可能となる。

【００５１】次に、図２０乃至図２２を参照して、第３の実施の形態について説明する。図２０に示すように、上記第２の実施の形態において説明した、コンタクトプローブ２００におけるコンタクトピン３ａは、その先端が正常な先端Ｓの他に、上方に湾曲した先端Ｓ１や下方に湾曲した先端Ｓ２が生じることがあった。この場合、図２１に示すように、上記樹脂フィルム２０１を第１の突起１１２およびボトムクランプ１１５で挟持してコンタクトピン３ａをＬＣＤ９０の端子に押しつけても、正常な先端Ｓ１および下方に湾曲した先端Ｓ２は、ＬＣＤ９０の端子に接触するが、上方に湾曲した先端Ｓ１は、仮に接触したとしても十分な接触圧が得られないことがあった。このことから、コンタクトピン３ａのＬＣＤ９０に対する接触不良が発生し正確な電気テストが行えないことがあった。また、テスト時に所望の接触圧を得るためにコンタクトピン３ａの押し付け量を増減させるが、大きな接触圧を得るためには大きな押し付け量が必要となるものの、針の形状からその量には限度があり、大きな接触圧を得られないことがあった。

【００５２】そこで、第３の実施の形態では、図２０乃至図２２に示すように、コンタクトピン３ａの上方に湾曲した先端Ｓ１と下方に湾曲した先端Ｓ２とを正常な先端Ｓと整列させるため、樹脂フィルム２０１の上部に有機または無機材料からなる強弾性フィルム４００を、コンタクトピン３ａが突出する側の樹脂フィルム２０１に、該コンタクトピン３ａよりも短く突出するように重ね合わせ、その状態でコンタクトプローブ２００および強弾性フィルム４００を、トップクランプ１１１の第１の突起１１２とボトムクランプ１１５とで挟持してなるコンタクトプローブ挟持体１１０を採用した。この場合、強弾性フィルム４００は、その先端側が下方に向けて折曲され、上方に湾曲した先端Ｓ１を押圧するようになっている。

【００５３】なお、強弾性フィルム４００は、有機材料であれば、ポリエチレンテレフタレートなどからなり、無機材料であれば、セラミックス、特にアルミナ製フィルムからなることが好ましい。また、本実施形態のようにコンタクトピン３ａをＬＣＤ９０の端子面に平行に配設する場合には、上方に湾曲した先端Ｓ１を適宜押圧できるように、前記強弾性フィルム４００の先端側を下方に向けて折曲させるが、コンタクトピン３ａを前記端子

面に対して傾斜させて配設する場合には、強弾性フィルム４００を折曲しなくても前記先端Ｓ１を押圧することができる。

【００５４】このコンタクトプローブ挟持体１１０を額縁状フレーム１２０（図１７参照）に固定し、コンタクトピン３ａをＬＣＤ９０の端子に押し当てると、強弾性フィルム４００がコンタクトピン３ａを上方から押さえ、前記上方に湾曲した先端Ｓ１であってもＬＣＤ９０の端子に確実に接触する。これにより、各コンタクトピン３ａに均一な接触圧が得られ、接触不良による測定ミスをなくすことができる。

【００５５】さらに、強弾性フィルム４００からのコンタクトピン３ａの突出量を変化させることにより、コンタクトピン３ａを押しつけたときにコンタクトピン３ａを上から押さえるタイミングを変えることが可能となり、所望の押しつけ量で所望の接触圧を得ることができる。

【００５６】上記第３の実施形態におけるＬＣＤ用プローブ装置１００の場合、コンタクトピン３ａを、図２２に示すように、例えば端子面に対して平行に配設した場合には該コンタクトピン３ａと端子面との間に角度が無い分、特に、前記ピン先端が上方に湾曲したものＳ１が存在していると、オーバードライブしてもコンタクトが不確実となることが考えられるが、本プローブ装置１００では、その危惧がない。

【００５７】次に、図２３および図２４を参照して、第４の実施形態について説明する。図２３に示すように、樹脂フィルム２０１の上に金属フィルム５００を張り付け、その上にさらに第２の樹脂フィルム２０２を張り付ける構成を採用するとともに、図２４に示すように、この第２の樹脂フィルム２０２の上に強弾性フィルム４００を設けたものである。ここで、第２の樹脂フィルム２０２を設けたのは、コンタクトプローブ２００とＴＡＢＩＣ３００の端子３０１とを接続させるべく、トップクランプ１１１の突起１１３で端子３０１を押さえたときに、金属フィルム５００とＴＡＢＩＣ３００の端子３０１とのショートを防ぐためである。また、第２の樹脂フィルム２０２を設けることで、金属フィルム５００の表面が覆われることになり、大気中での酸化の進行を有効に抑えることができる。

【００５８】次に、図２５および図２６を参照して、第５の実施形態について説明する。上述した実施形態では、強弾性フィルム４００がコンタクトピン３ａに押圧接触しており、繰り返しの使用により強弾性フィルム４００とコンタクトピン３ａの摩擦が繰り返され、これによる歪みが蓄積されると、コンタクトピン３ａが左右に曲がり、接触点がずれることがあった。

【００５９】そこで、第５の実施形態では、図２５に示すように、前記樹脂フィルム２０１を従来よりも幅広なフィルム２０１ａとするとともに、コンタクトピン３ａ

の金属フィルム５００からの突出長さをＸ１、幅広樹脂フィルム２０１ａの金属フィルム５００からの突出長さをＸ２とすると、Ｘ１＞Ｘ２とする構成を採用した。そして、図２６に示すように、前記強弾性フィルム４００を幅広樹脂フィルム２０１ａよりも短く突出するように重ねて使用すると、強弾性フィルム４００は、柔らかい幅広樹脂フィルム２０１ａに接触し、コンタクトピン３ａとは直接接触しないため、コンタクトピン３ａが左右に曲がることが防止できる。

【００６０】上記第５実施形態におけるＬＣＤ用プローブ装置１００では、前記幅広フィルム２０１ａが前記強弾性フィルム４００よりも先端側に長く形成されて該強弾性フィルム４００がコンタクトピン３ａを押圧するときに緩衝材となるため、繰り返しオーバードライブをかけても、強弾性フィルム４００との摩擦によりコンタクトピン３ａが歪んで湾曲すること等がなく、端子に対して安定した接触を保つことができる。この場合、図２６に示すように、コンタクトピン３ａを、例えば端子面に対して平行に配設した場合には該コンタクトピン３ａと端子面との間に角度が無い分、特に、前記ピン３ａに湾曲したもの等が存在していると、オーバードライブしてもコンタクトが不確実となることが考えられるが、本プローブ装置１００では、その危惧がない。

【００６１】次に、図２７および図２８を参照して、第６の実施の形態について説明する。金属フィルム５００の上に第２の樹脂フィルム２０２を張り付け、その場合、コンタクトピン３ａの金属フィルム５００からの突出長さをＸ１、幅広樹脂フィルム２０１ａの金属フィルム５００からの突出長さをＸ２とすると、Ｘ１＞Ｘ２の関係になるように構成する。そして、図２８に示すように、第２の樹脂フィルム２０２の上に設ける強弾性フィルム４００は、幅広樹脂フィルム２０１ａよりも短く突出するように重ねるようにしてもよい。

【００６２】

【発明の効果】本発明は、以上説明したとおりに構成されているので、以下に記載するような効果を奏する。本発明のコンタクトプローブおよびその製造方法は、コンタクトピンをその先端部が本体部の下面より垂直に突出した状態で一体成形するので、前記先端部の寸法を高精度にして、先端部の高さを各ピンにおいて揃えることができ、従来のような研磨が不要になる。結果的に、接触精度が向上し、オーバードライブ量が少なくて済む。また、パッドがアルミニウムと比較して軟質な材料（例えば金）により形成されている場合、コンタクトプローブをパッド面に対して平行に配設し、オーバードライブをかけるだけで、コンタクトピンの先端部がパッドに接触し、下地に傷を付けることなく良好な導電性を確保することができる。このことから、従来に比べて、コンタクトプローブを組み込むための部品や治具等の構造が単純化され、加工を容易にすることができる。さらに、コン

タクトピンの先端部の下面が平面であっても、オーバードライブ量を増加させることにより、針圧を高くできて、パッドに対して食い込むため、良好なコンタクトを得ることができる。コンタクトピンの先端部は本体部よりも硬い材料で形成されているので、この先端部の耐摩耗性が向上して、コンタクトピン全体の寿命が延びる。そして、前記先端部はその下端に向けて断面積が漸次小さくなる形状とされているので、例えばコンタクトピンをパッド面に対して平行に配設した場合であっても、オーバードライブ時に前記先端部は、局部的針圧が高く、パッドに対して食いつき易く、その結果、アルミニウムの表面酸化膜を良好に破ることができる。第１の金属層の厚さにより、コンタクトピンの先端部の高さを容易に調整できる。ボールまたは針の表面を予め粗くすることにより、ボール（または針）はベースメタル層に安定に支持されるとともに、ボール（または針）と第２の金属層との接着強度が高くなる。

【００６３】また、前記フィルムには、金属フィルムが直接張り付けられて設けられているため、前記フィルムが、例えば水分を吸収して伸張し易い樹脂フィルム等であっても、該金属フィルムにより前記フィルムの伸びが抑制される。したがって、フィルムの伸びによってコンタクトピンのピッチがずれることがなく、各パッドとの確実なコンタクトをとることができる。

【００６４】さらに、前記金属フィルムに、第２のフィルムが直接張り付けられて設けられているため、各種部品によるコンタクトプローブの組み込み時の締付けに対して緩衝材となるという効果が得られる。したがって、組み込み時に配線パターンに与えるダメージを軽減させることができる。また、ＬＣＤ用のものにあっては、金属フィルムとＴＡＢＩＣの端子とのショートを防止することができる。

【００６５】本発明のプローブ装置によれば、強弾性フィルムがコンタクトピンの先端を上方から押さえるため、ピン先端が上方に湾曲したものが存在しても、パッドに確実に接触させることができ、各ピンに均一な接触圧が得られるところから接触不良による測定ミスをなくすことができる。この場合、コンタクトピンを、例えばパッド面に対して平行に配設した場合には該コンタクトピンとパッド面との間に角度が無い分、特に、前記ピン先端が上方に湾曲したものが存在していると、オーバードライブしてもコンタクトが不確実となることが考えられるが、本プローブ装置では、その虞がない。

【００６６】また、前記フィルムが前記強弾性フィルムよりも先端側に長く形成されて該強弾性フィルムがコンタクトピンを押圧するときに緩衝材となるため、繰り返しオーバードライブをかけても、強弾性フィルムとの摩擦によりコンタクトピンが歪んで湾曲すること等がなく、パッドに対して安定した接触を保つことができる。この場合、コンタクトピンを、例えばパッド面に対して

平行に配設した場合には該コンタクトピンとパッド面との間に角度が無い分、特に、前記ピンに湾曲したもの等が存在していると、オーバードライブしてもコンタクトが不確実となることが考えられるが、本プローブ装置では、その虞がない。

【図面の簡単な説明】

【図１】　本発明に係るコンタクトプローブの製造方法の第１の実施形態における第１の露光工程等を示す要部斜視図である。

【図２】　（ａ）は本発明に係るコンタクトプローブの製造方法の第１の実施形態における第１の露光工程後の斜視図、（ｂ）は（ａ）のＸ－Ｘ線断面図である。

【図３】　本発明に係るコンタクトプローブの製造方法の第１の実施形態におけるボール挿入工程を示し、（ａ）はハーフエッチング工程、（ｂ）はボール押し込み工程、（ｃ）はメッキ処理工程を示し、（ｄ）はボールに代えて針を用いた場合を示す図である。

【図４】　（ａ）は本発明に係るコンタクトプローブの製造方法の第１の実施形態における第２の露光工程前を示す斜視図、（ｂ）は（ａ）のＹ－Ｙ線断面図である。

【図５】　（ａ）は本発明に係るコンタクトプローブの製造方法の第１の実施形態における第２の露光工程後を示す斜視図、（ｂ）は（ａ）のＺ－Ｚ線断面図である。

【図６】　本発明に係るコンタクトプローブの製造方法の第１の実施形態における電解メッキ工程後の断面図である。

【図７】　図６の状態から第２のフォトレジスト層９を除去した状態を示す断面図である。

【図８】　は本発明に係るコンタクトプローブの製造方法の第１の実施形態におけるフィルム接着工程後の断面図である。

【図９】　（ａ）は本発明に係るコンタクトプローブの製造方法の第１の実施形態における最終段階の要部概略斜視図であり、（ｂ）は断面図である。

【図１０】　本発明に係るコンタクトプローブの製造方法の第１の実施形態により製造されたコンタクトプローブを組み込んだプローブ装置の一例を示す側面図である。

【図１１】　本発明に係るコンタクトプローブの製造方法の第１の実施形態により製造されたコンタクトプローブを示す平面図である。

【図１２】　図１１のＣ－Ｃ線断面図である。

【図１３】　本発明に係るコンタクトプローブの第１の実施形態において金属フィルムを説明するための正面図である。

【図１４】　本発明に係るプローブ装置の第２の実施形態におけるコンタクトプローブを示す斜視図である。

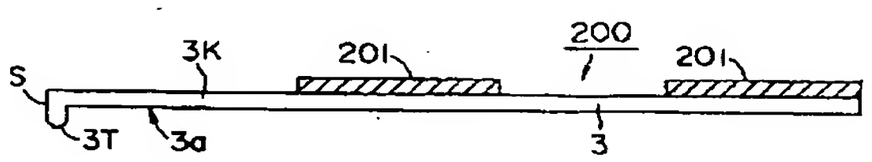
【図１５】　図１４のＡ－Ａ線断面図である。

【図１６】　本発明に係るプローブ装置の第２の実施形態におけるコンタクトプローブ挟持体を示す分解斜視図

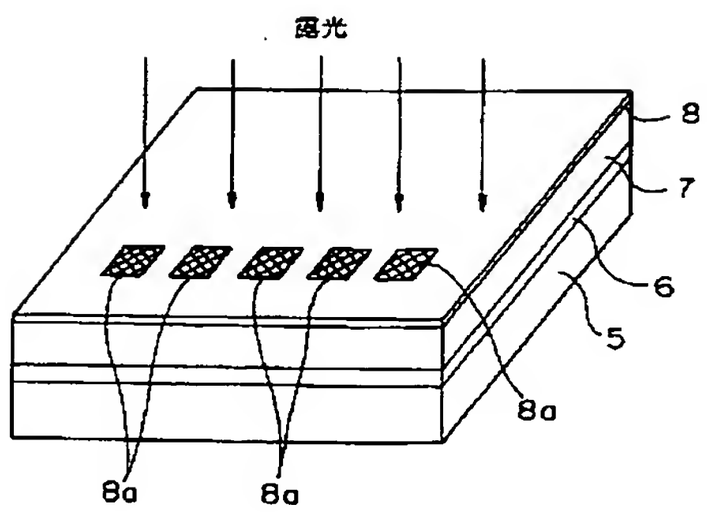
である。
【図１７】　本発明に係るプローブ装置の第２の実施形態におけるプローブ装置を示す斜視図である。
【図１８】　本発明に係るプローブ装置の第２の実施形態におけるコンタクトプローブ挟持体を示す斜視図である。
【図１９】　図１７のＢ－Ｂ線断面図である。
【図２０】　本発明に係るプローブ装置の第３の実施形態に関してコンタクトプローブの従来の欠点を示す側面図である。
【図２１】　本発明に係るプローブ装置の第３の実施形態に関してプローブ装置の従来の欠点を示す側面図である。
【図２２】　本発明に係るプローブ装置の第３の実施形態におけるプローブ装置を示す側面図である。
【図２３】　本発明に係るコンタクトプローブの第４の実施形態におけるコンタクトプローブを示す側面図である。
【図２４】　本発明に係るプローブ装置の第４の実施形態におけるプローブ装置を示す側面図である。
【図２５】　本発明に係るプローブ装置の第５の実施形態におけるコンタクトプローブを示す側面図である。
【図２６】　本発明に係るプローブ装置の第５の実施形態におけるプローブ装置を示す側面図である。
【図２７】　本発明に係るプローブ装置の第６の実施形態におけるコンタクトプローブを示す側面図である。
【図２８】　本発明に係るプローブ装置の第６の実施形態におけるプローブ装置を示す側面図である。
【図２９】　従来のコンタクトプローブを示す要部斜視図である。
【図３０】　従来のコンタクトプローブを組み込んだプローブ装置の一例を示す側面図である。
【図３１】　従来のコンタクトプローブにおいてコンタクトピンの先端を折り曲げた例を示す図である。
【符号の説明】

1	コンタクトプローブ
2	フィルム（樹脂フィルム）
2a	接着剤
2e	フィルム面
2k	フィルム先端部
3	パターン配線
3a，3a2	コンタクトピン
3b	下面
＊3K	本体部
3T	先端部（接触部）
5	基板層（支持金属板）
6	第１の金属層（ベースメタル層）
6a	開口部
7	第１のフォトレジスト層（第１のマスク）
7a	マスクされていない部分（開口部）
8a	第１のフォトマスク
9	第２のフォトレジスト層（第２のマスク）
9a	開口部
10	引き出し用配線
10b	第２のフォトマスク
11	窓
20	基板（プリント基板）
30，31，50	部品
70	プローブ装置（プローブカード）
90	ＬＣＤ
100	プローブ装置
110	コンタクトプローブ挟持体
111	トップクランプ
112	第１の突起
113	第２の突起
114	第３の突起
115	ボトムクランプ
120	額縁状フレーム
130	ボルト
200	コンタクトプローブ
201	フィルム
201a	フィルム（幅広フィルム）
202	第２のフィルム
300	回路（ＴＡＢＩＣ）
301	端子
400	強弾性フィルム
500	金属フィルム
N	第２の金属層（ＮｉまたはＮｉ合金層）
P，P2	パッド
Pa	パッド面
S，S1，S2	先端
θ	接触角
＊	

【図１５】



【図１】



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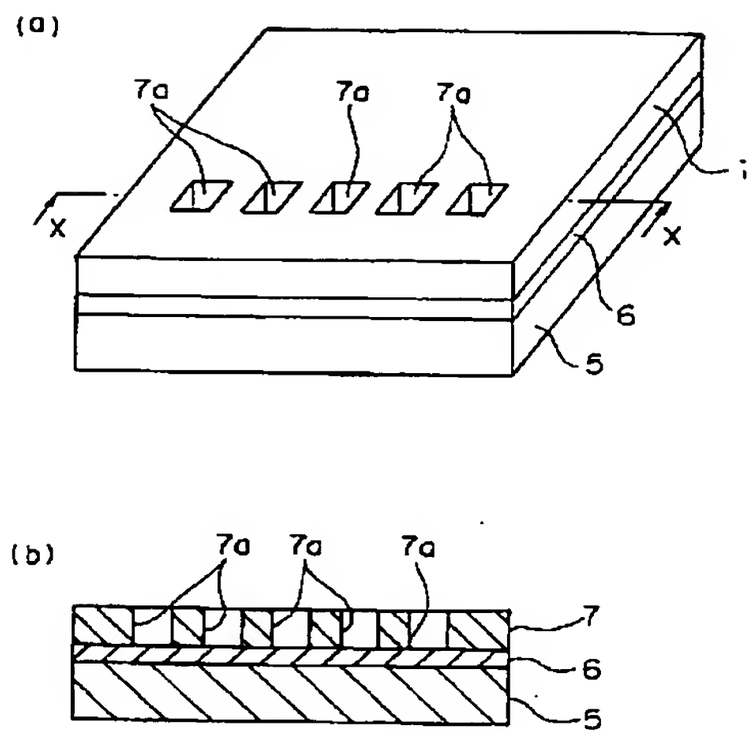

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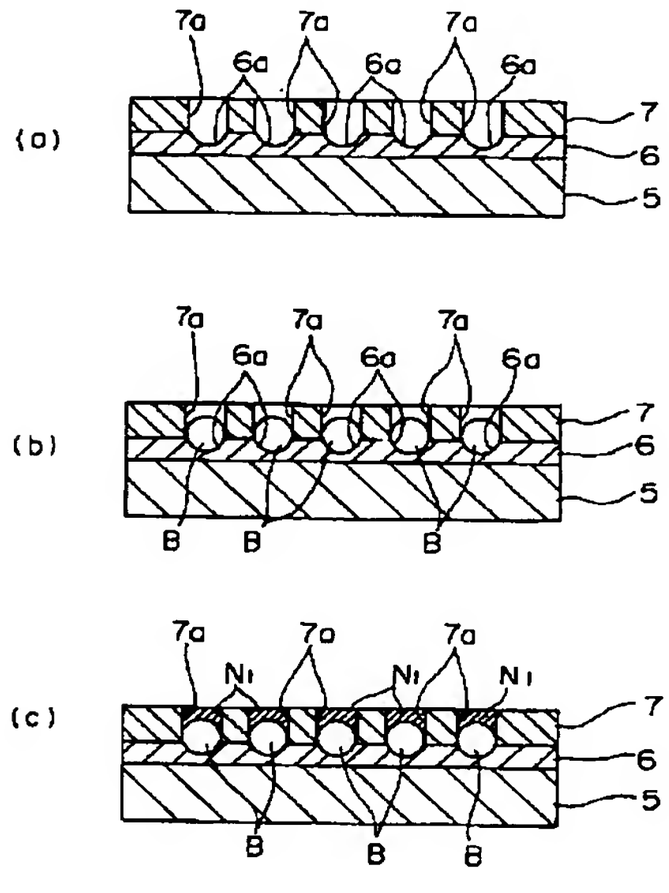

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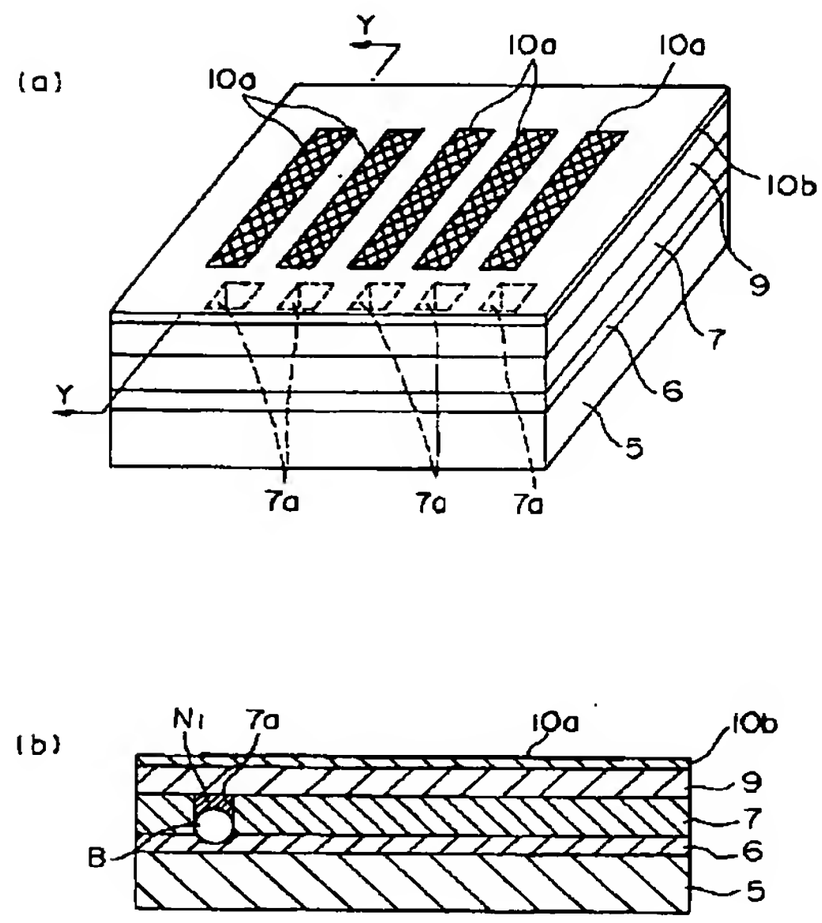

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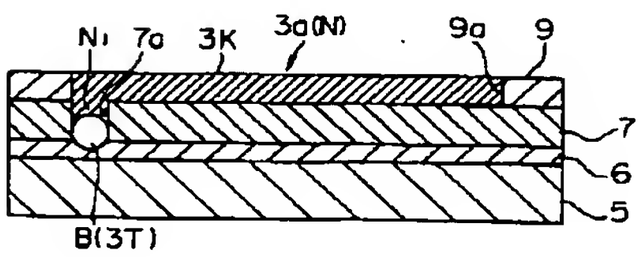

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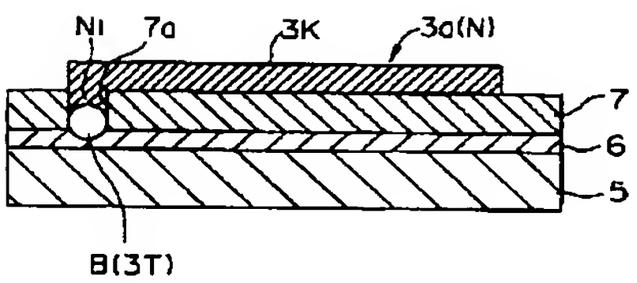

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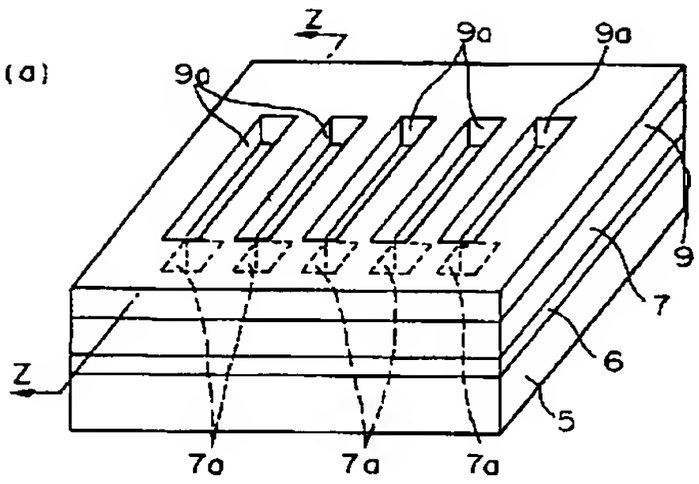

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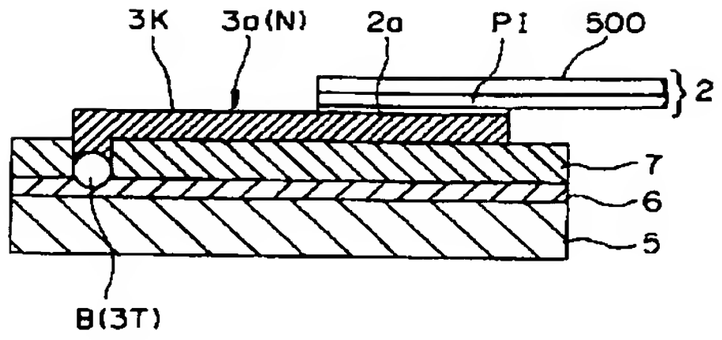
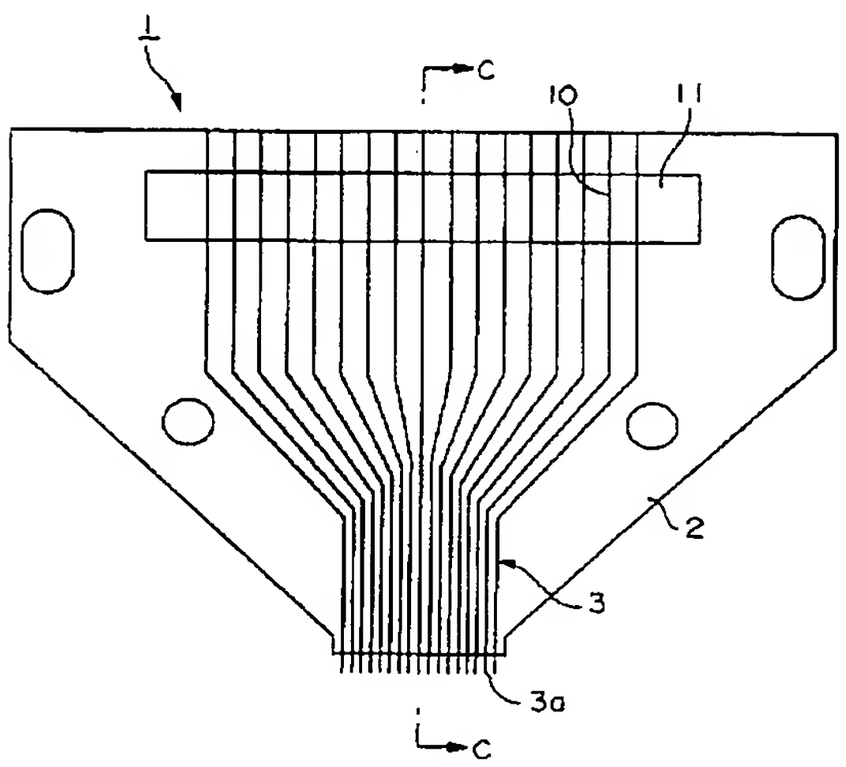
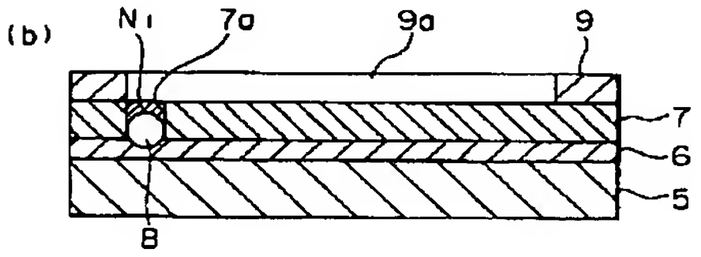


【図１１】





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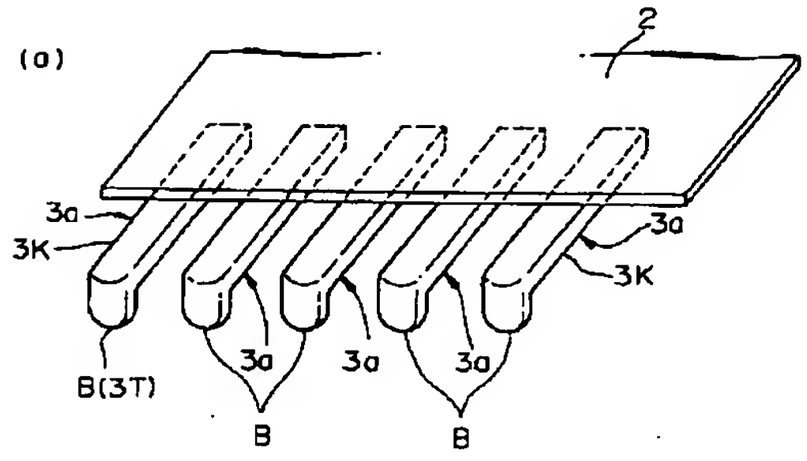
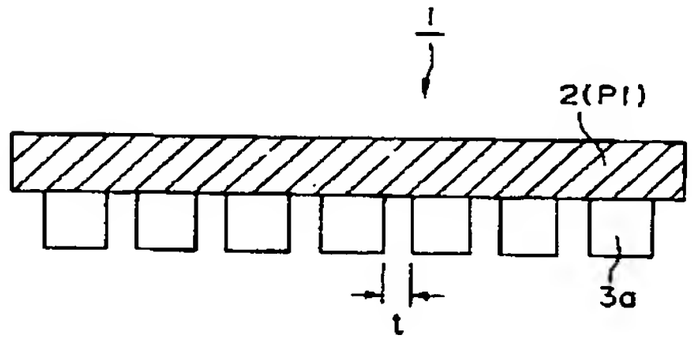
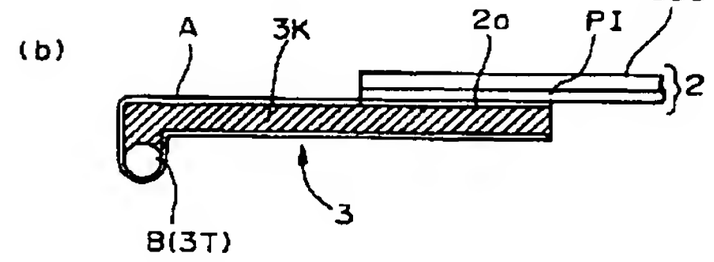


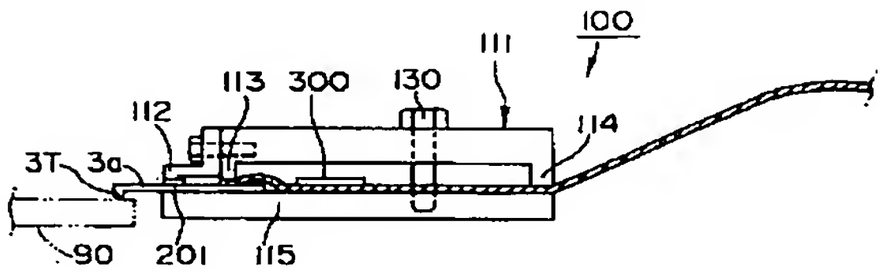
【図１３】

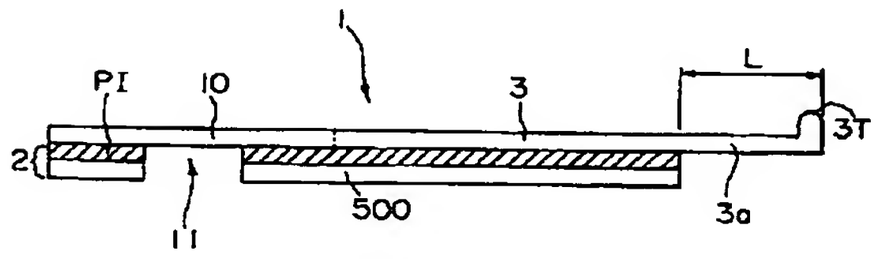




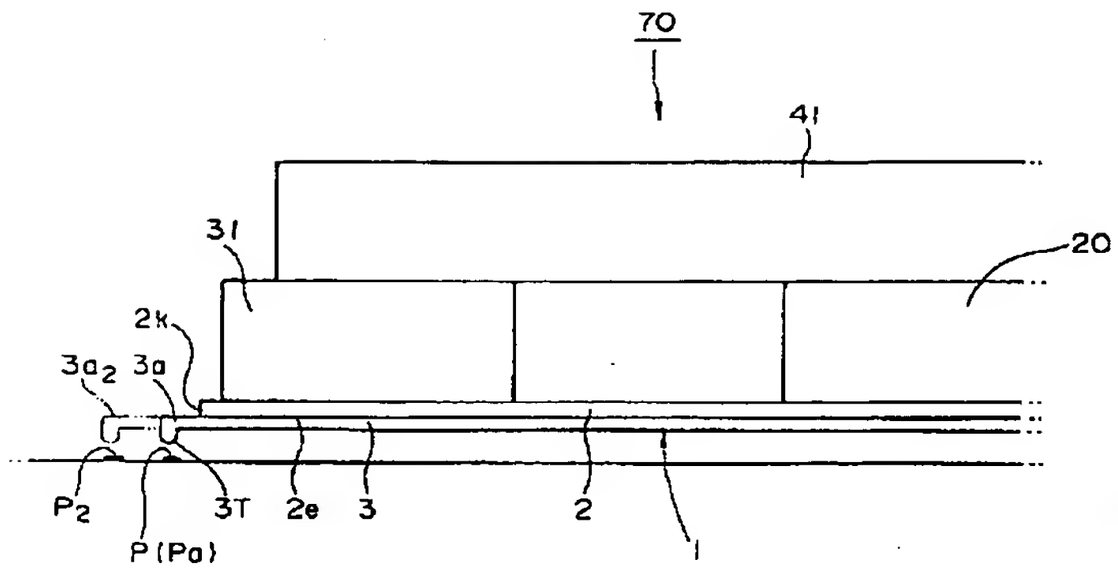
【図１２】

【図１９】

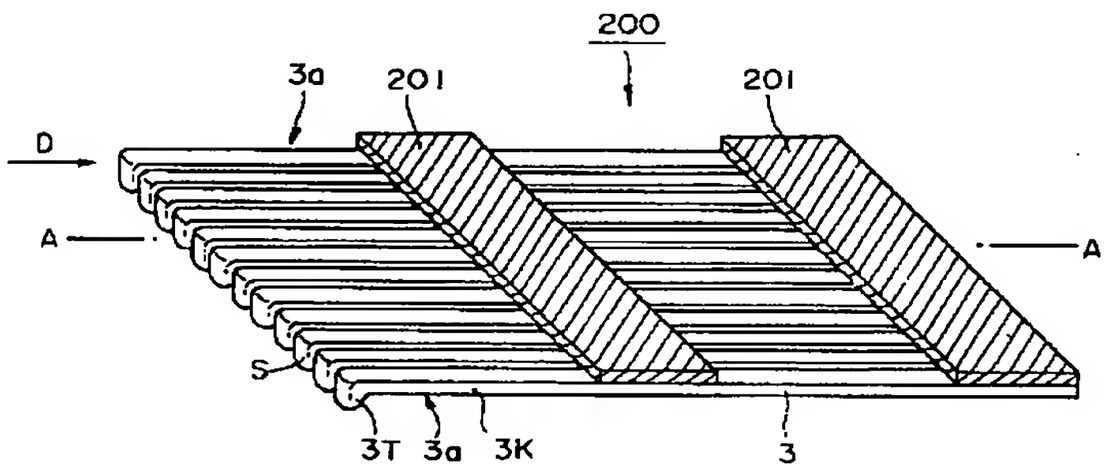




【図１０】



【図１４】



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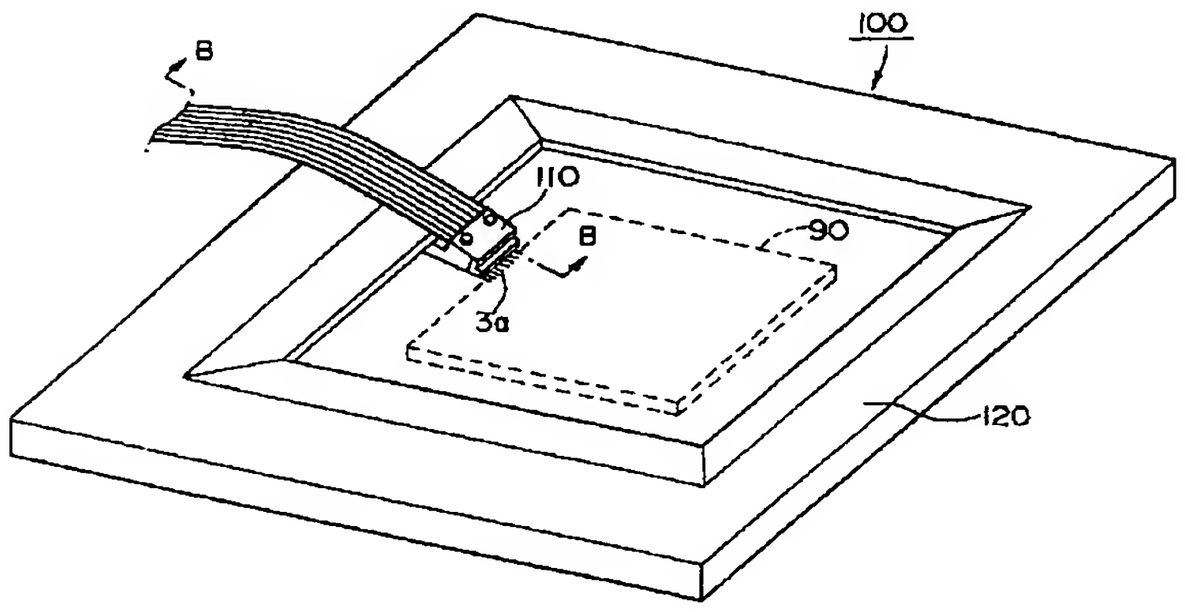
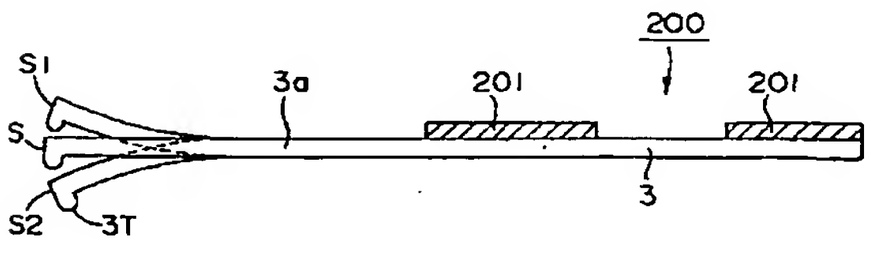
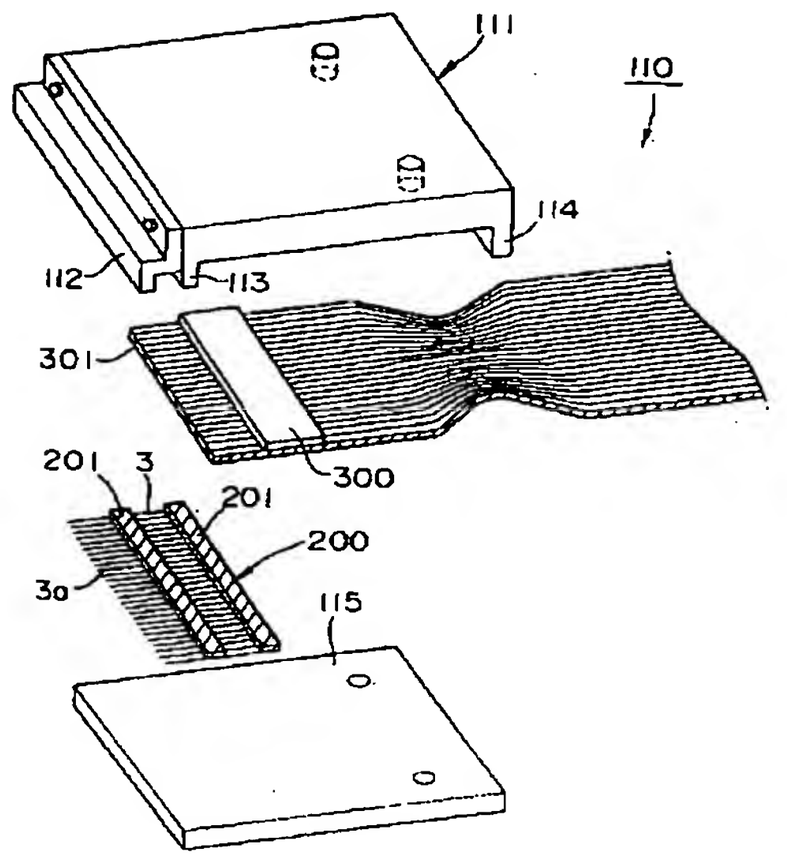


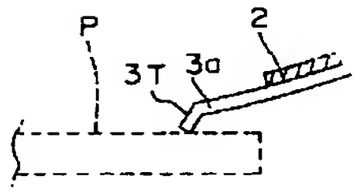
【図２０】



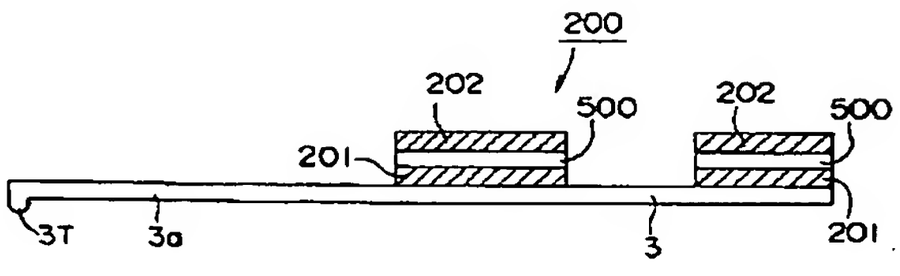
【図１６】



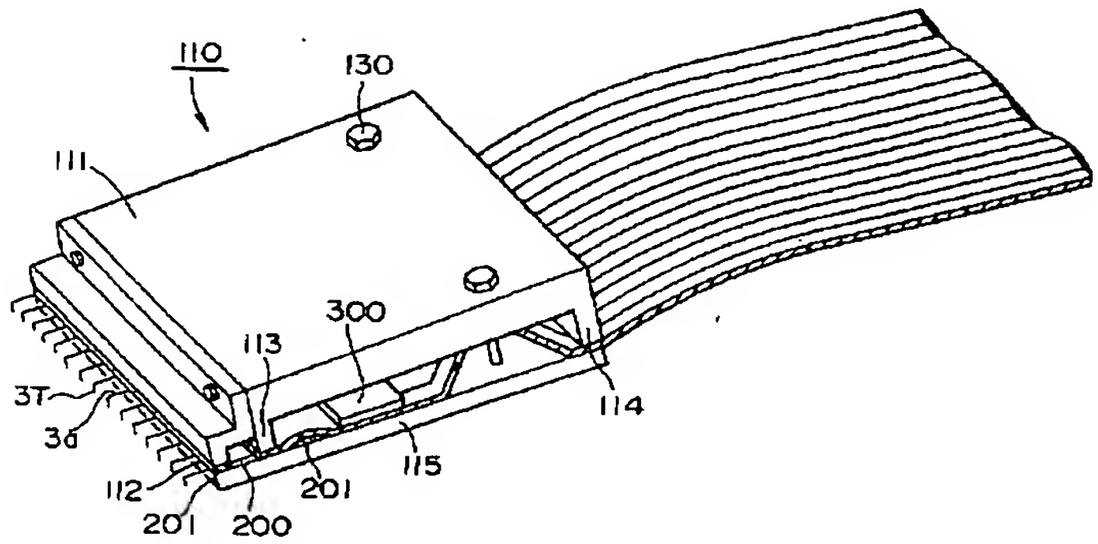
【図３１】



【図２３】



【図１８】



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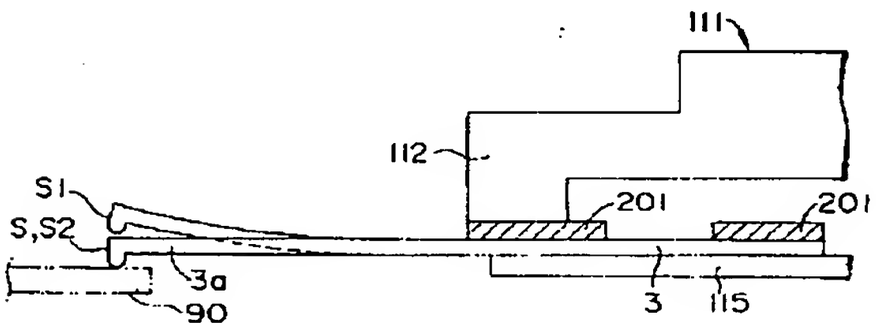

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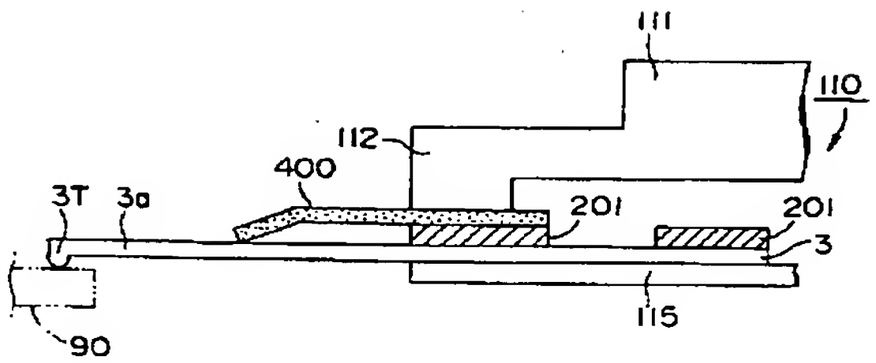

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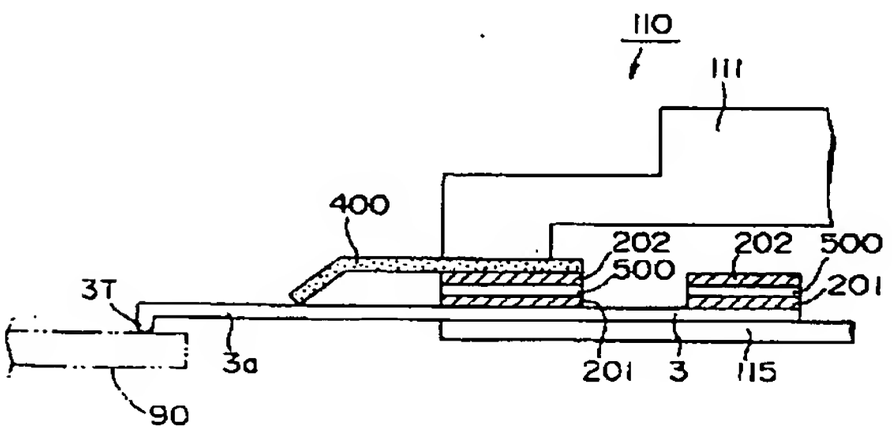

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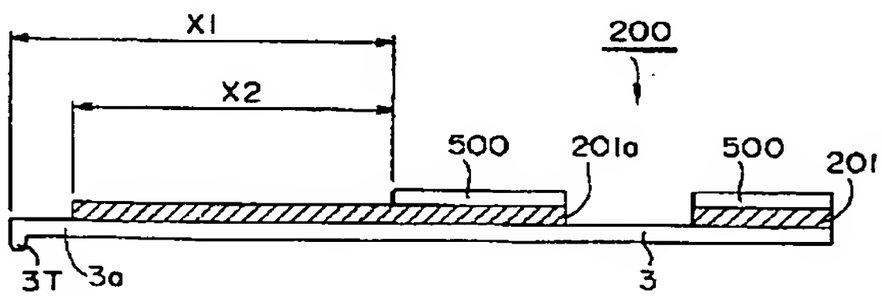

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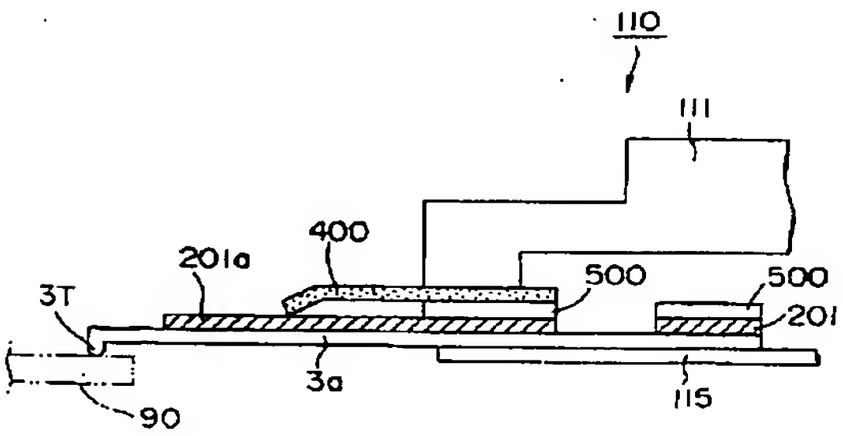

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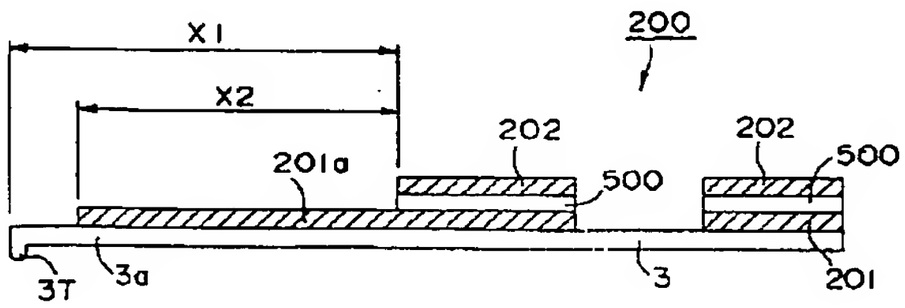

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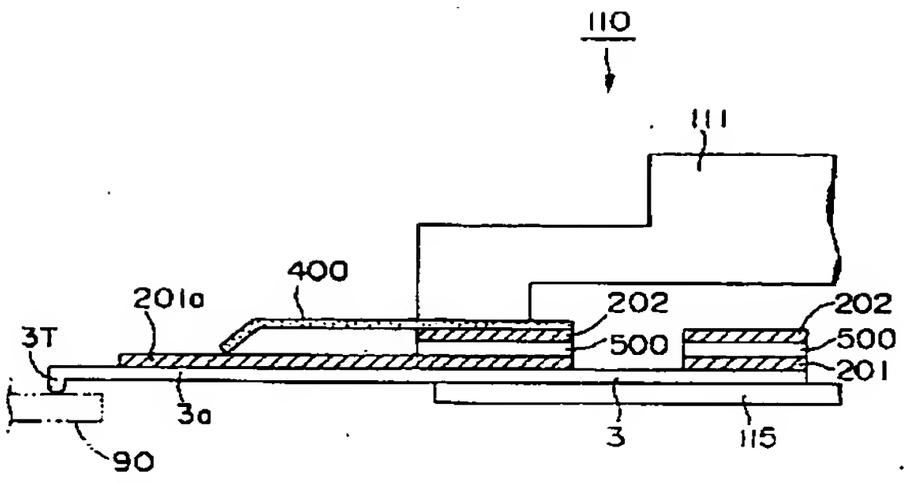
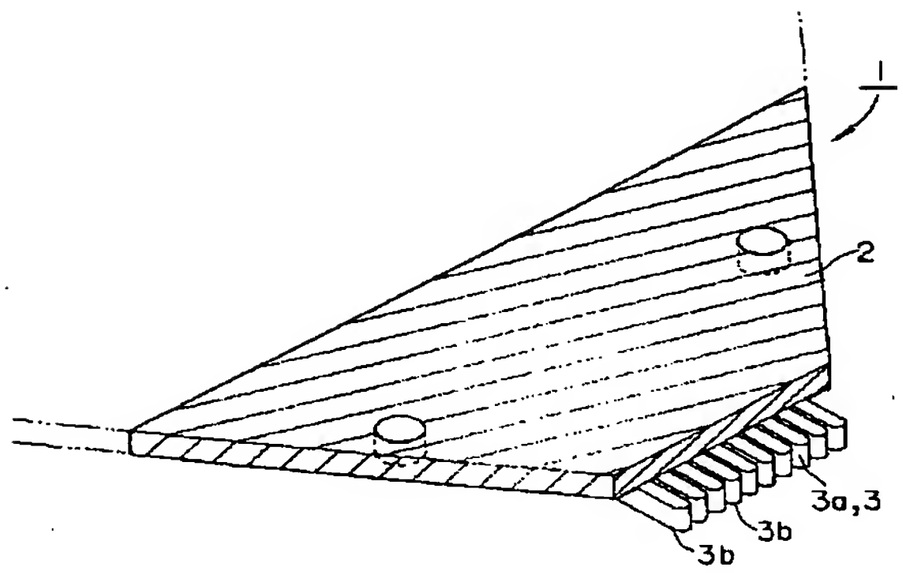
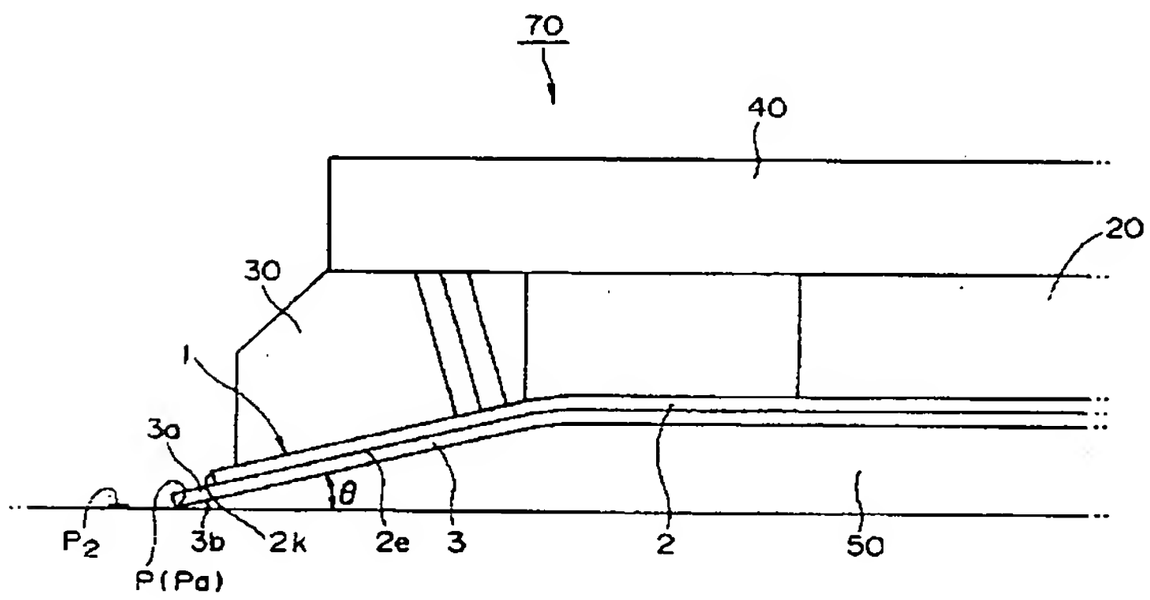

110
111
400
201a
202
202
3T
500
500
201
3a
3
115
90

【図２９】


1
2
3a,3
3b
3b

【図３０】


70
40
20
30
1
3a
θ
P2
3b
2k
2e
3
2
50
P(Pa)

PATENT ABSTRACTS OF JAPAN

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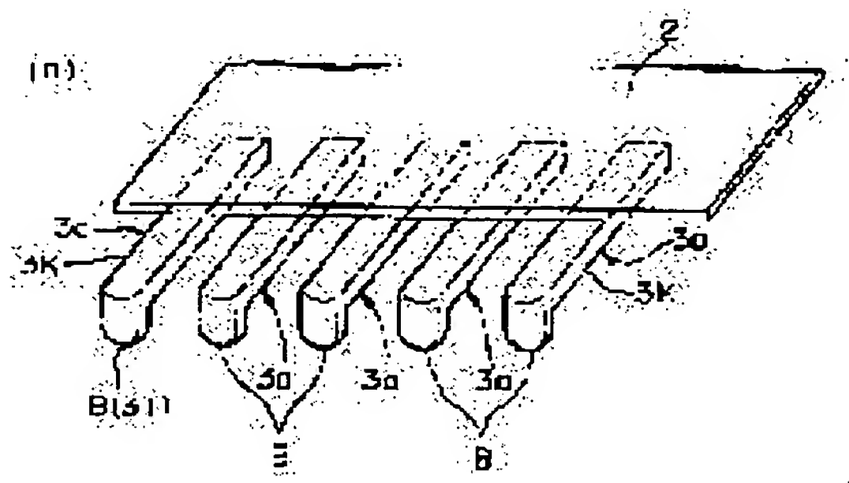
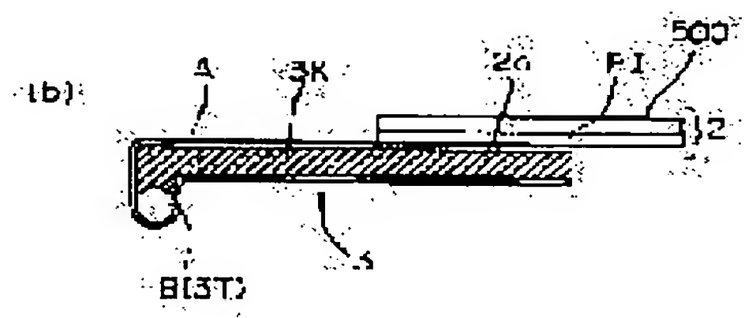
(54) CONTACT PROBE AND ITS MANUFACTURE, AND PROBE APPARATUS HAVING CONTACT PROBE

(57)Abstract:
PROBLEM TO BE SOLVED: To improve contact accuracy by uniforming tips of contact pins in height without grinding and making the contact pins touch a pad at the same time.
SOLUTION: Contact pins 3a are integrally molded with the use of a mask exposure technique in a state with tip parts (tungsten balls in this case) 3T projecting perpendicularly downward from main body parts 3K. Therefore, the tip parts 3T are highly accurate in size and uniform in height, eliminating conventional grinding. When a pad is formed of, e.g. soft gold, it is enough to set a contact probe in parallel to a pad face and carry out overdriving, whereby the tip parts 3T remove only an oxidization film on the pad face and surely touch an undercoat of the pad. Since tips of the pins are not required to be ground and the contact probe is not required to be inclined when arranged, parts, jigs, etc., for fitting the contact probe are simplified in structure as compared with the prior art.





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[Date of registration]

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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] It is the contact probe (1,200) which two or more pattern wiring (3) is formed on a film (2,201,201a), and each tip of these pattern wiring (3) projects from said film (2,201,201a), is arranged on a condition, and is used as a contact pin (3a). Said contact pin (3a) is really fabricated, after the point (3T) has projected perpendicularly below to the body section (3K). And said point (3T) is a contact probe characterized by being formed with the conductive ingredient harder than said body section (3K) and.
[Claim 2] Said point (3T) is a contact probe according to claim 1 made into the configuration to which the cross-sectional area becomes small gradually towards the lower limit.
[Claim 3] The contact probe according to claim 1 or 2 which contains the ball or needle made from a tungsten in said point (3T).
[Claim 4] A contact probe given in any 1 term of claim 1 which a metal film (500) is directly stuck on said film (2,201,201a), and is prepared in it thru/or claim 3.
[Claim 5] The contact probe according to claim 4 which the 2nd film (202) is directly stuck on said metal film (500), and is formed in it.
[Claim 6] The metal layer formation process which forms the 1st metal layer (6) which consists of the quality of the material put or combined with the point (3T) of a contact pin (3a) on a substrate layer (5), The 1st pattern formation process which forms opening (7a) for giving the 1st mask (7) on the 1st metal layer (6), and inserting the point (3T) of said contact pin (3a) in this 1st mask (7), The point (3T) which consists of a conductive ingredient harder than the body section (3K) of said contact pin (3a) and is inserted in said opening (7a). The 2nd mask (9) is given on the point insertion process forced on said 1st metal layer (6), and the 1st metal layer (6). Opening (9a) for forming the body section (3K) of said contact pin (3a) in this 2nd mask (9) The 2nd pattern formation process formed so that the end section may lap with said opening (7a) of said 1st mask (7), Plating down stream processing which forms in each opening (7a) of said 1st mask (7), and each opening (9a) of the 2nd mask (9) the 2nd metal layer (N1, N) with which a contact pin (3a) is presented by plating processing, The covering process which puts the film (2,201,201a) which covers except the part with which said contact pin (3a) is presented on the 2nd metal layer (N) except the 2nd mask (9), The manufacture approach of the contact probe characterized by having the separation process which separates the part which consists of said substrate layer (5), the 1st [said] metal layer (6), and the 1st mask (7) from the part which consists of said film (2,201,201a) and said 2nd metal layer (N).
[Claim 7] Said point (3T) is the manufacture approach of the contact probe according to claim 6 which is a ball (B) or a needle.
[Claim 8] The manufacture approach of a contact probe according to claim 6 or 7 of performing the process which forms the 2nd metal layer (N1) in each opening (7a) of said 1st mask (7) after said point insertion process.
[Claim 9] The manufacture approach of a contact probe given in any 1 term of claim 6 which processes the front face of said point (3T) coarsely beforehand thru/or claim 8.
[Claim 10] It is probe equipment (100) which it comes to connect with the circuit (300) which has the terminal (301) by which a contact probe (200) given in any 1 term of claim 1 thru/or

claim 5 is connected to each end face of pattern wiring (3). The ferroelasticity film which this probe equipment (100) is arranged on said film (201,201a), and projects from this film (201,201a) shorter than said contact pin (3a) (400), Probe equipment characterized by having the contact probe pinching object (110) which pinches this ferroelasticity film (400) and said contact probe (200).

[Claim 11] It is probe equipment (100) which it comes to connect with the circuit (300) which has the terminal (301) by which the contact probe (200) manufactured by the manufacture approach given in any 1 term of claim 6 thru/or claim 9 is connected to each end face of pattern wiring (3). The ferroelasticity film which this probe equipment (100) is arranged on said film (201,201a), and projects from this film (201,201a) shorter than said contact pin (3a) (400), Probe equipment characterized by having the contact probe pinching object (110) which pinches this ferroelasticity film (400) and said contact probe (200).

[Claim 12] Said film (201a) is probe equipment characterized by being formed for a long time [a tip side] than said ferroelasticity film (400) so that it may become shock absorbing material, when said ferroelasticity film (400) presses said contact pin (3a) in probe equipment (100) according to claim 10 or 11.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention is used as a probe pin, a socket pin, etc., and relates to the manufacture approach of a contact probe of contacting each terminal, such as a semiconductor IC chip and a liquid crystal device, and performing an electric test.
[0002]
[Description of the Prior Art] The contact pin is used, in order to make each terminal of semiconductor chips, such as IC chip and an LSI chip, or LCD (liquid crystal display object) contact and to perform an electric test generally. While the contact pad which is an electrode is formed into a ** pitch with high integration and detailed-izing of IC chip etc. in recent years, multi-pin ** pitch-ization of a contact pin is demanded. However, in the contact probe of the tungsten needle used as a contact pin, the correspondence to a multi-pin ** pitch from the limitation of the path of a tungsten needle was difficult.
[0003] On the other hand, as shown in drawing 29 , two or more pattern wiring 3 is formed on the resin film 2, and the technique of the contact probe 1 in which each tip of these pattern wiring 3 projects from said resin film 2, is allotted to a condition, and is set to contact pin 3a is proposed (for example, JP,7-82027,B). In this technical example, multi-pin ** pitch-ization is attained by setting the tip of two or more pattern wiring 3 to contact pin 3a.
[0004] Generally, each terminal (pad), such as IC chip formed with aluminum (aluminum) alloy etc., is in the condition that the front face oxidized in air and was covered by the thin scaling film of aluminum. Therefore, in order to perform the electric test of a pad, it is necessary to make the scaling film of said aluminum exfoliate, to expose internal aluminum, and to secure conductivity. Then, he grinds the scaling film of the aluminum on the front face of a pad against the point of contact pin 3a, and is trying to expose internal aluminum by applying an overdrive in said contact probe 1, contacting contact pin 3a on the surface of a pad. This activity is called a scrub (scrub).
[0005] By the way, manufacture of said contact probe 1 is performed through the following processes.
** Perform coppering to the top face of a stainless plate.
** Form a resist mask (mask) in this copper layer, and perform exposure and development through a photo mask.
** Perform nickel plating to the part by which a resist mask is not carried out, and form said pattern wiring 3.
** Make said resin film 2 put on the top face of the part except the point set to said contact pin 3a among this pattern wiring 3.
** Make the part which consists of this resin film 2, pattern wiring 3, and said copper layer, and said stainless plate separate.
** Remove a part to said copper layer from this resin film 2 and the pattern wiring 3, and produce said contact probe 1.
[0006] According to the above-mentioned manufacture approach, inferior-surface-of-tongue 3b of said contact pin 3a is formed evenly. For this reason, if said contact pin 3a is arranged so that

that axis may become parallel to a pad side, even if it carries out an overdrive, it is only contacting in parallel and this pad side and said flat inferior-surface-of-tongue 3b cannot grind the scaling film of aluminum good. From this, as shown in drawing 30 , it inclined and said contact pin 3a was arranged so that it might have the fixed contact angle theta to the pad side Pa.
[0007] In order to arrange said contact pin 3a, holding said contact angle theta, the various components 30 and 50, a fixture, etc. for doing the predetermined angle theta inclination of said contact probe 1, and incorporating it are needed. Since these various components 30 and 50, fixtures, etc. are configurations incorporated in the condition of having made the contact probe 1 inclining, they become complicated [structure] compared with the thing in which the contact probe 1 is made to only lay horizontally. Furthermore, if said contact angle theta affects greatly scrub distance (die length which shaves off a coat along a putt front face), and the depth and this contact angle theta depends it how at the time of a scrub Since the point of contact pin 3a overflows Pad P or damages the pad P itself at the time of a scrub, sufficient precision to secure the accuracy of the contact angle theta is required of said components 30 and 50, and processing is difficult for them.
[0008]
[Problem(s) to be Solved by the Invention] By the way, it is necessary to prevent that face performing a scrub and a contact pin damages to the pad not only the scaling film of the aluminum on the front face of a pad but under it (substrate) itself. In order to prevent that the substrate of a pad gets damaged at the time of a scrub, to secure the contact angle over the pad of a contact pin to sufficient magnitude is needed. Because, when a contact angle is small, it is from the reason for the amount of removal of surface aluminum becoming remarkably large, and affecting even a pad substrate. Then, as shown in drawing 31 , using a fixture (un-illustrating), and bending point 3T of contact pin 3a so that it may become an abbreviation perpendicular to the contact surface P is considered.
[0009] However, since there is surely dispersion in the height and spacing of a point which the contact pin bent (i.e., since a non-set occurs in a pin lower limit), in case each terminal of semiconductor chips, such as a chip and an LSI chip, or a liquid crystal panel is made to contact, the condition of having not flowed arises and contact precision is bad. Moreover, if the amount of overdrives is made to increase, when the pad is especially formed with the elasticity ingredient (for example, gold) as compared with aluminum, the trouble that a blemish is attached is in a pad substrate. In addition, although the tip of a contact pin can be arranged by polish, this takes time and effort and a long time, and a patient throughput becomes low. Furthermore, although said contact pin covers that whole and is formed of the same quality of the material, if it tends to wear especially a point out and this abrasion loss exceeds the amount of conventions, the whole contact probe must be exchanged and it will also become the thing of a contact pin which a running cost increases.
[0010] While being made in view of the above-mentioned situation and polish being unnecessary, the height at the tip of each contact pin is arranged, each contact pin contacts coincidence at a pad in the case of an overdrive, contact precision of this invention is high, and it aims at providing with probe equipment the contact probe which reduces wear of the point of a contact pin and a running cost reduces and its manufacture approach, and a list.
[0011]
[Means for Solving the Problem] The contact probe of this invention for attaining the above-mentioned purpose It is the contact probe which two or more pattern wiring is formed on a film, and each tip of these pattern wiring projects from said film, is arranged on a condition, and is used as a contact pin. Said contact pin is really fabricated, after the point has projected perpendicularly below to the body section, and it is characterized by forming said point with the conductive ingredient harder than said body section and. Moreover, said point is made into the configuration to which the cross section becomes small gradually towards the lower limit. Furthermore, said point is the ball or needle made from a tungsten. And the 2nd film shall be directly stuck on what a metal film is directly stuck on said film, and is prepared in it, and said metal film, and shall be prepared in them.
[0012] The metal layer formation process with which the manufacture approach of the contact

probe of this invention forms the 1st metal layer which consists of the quality of the material put or combined with the point of a contact pin on a substrate layer, The 1st pattern formation process which forms opening for giving the 1st mask on the 1st metal layer, and inserting the point of said contact pin in this 1st mask, The point which consists of a conductive ingredient harder than the body section of said contact pin and is inserted in said opening. The 2nd mask is given on the point insertion process forced on said 1st metal layer, and the 1st metal layer. The 2nd pattern formation process which forms opening for forming the body section of said contact pin in this 2nd mask so that that end section may lap at said opening of said 1st mask, Plating down stream processing which forms in each opening of said 1st mask, and each opening of the 2nd mask the 2nd metal layer with which a contact pin is presented by plating processing, The covering process which puts the film which covers except the part with which said contact pin is presented on the 2nd metal layer except the 2nd mask, It is characterized by having the separation process which separates the part which consists of said substrate layer, the 1st [said] metal layer, and the 1st mask from the part which consists of said film and said 2nd metal layer. Moreover, said point is a ball or a needle. Furthermore, the process which forms the 2nd metal layer in each opening of said 1st mask may be performed after said point insertion process. And the front face of said ball or a needle is processed coarsely beforehand.

[0013] The probe equipment of this invention is probe equipment which it comes to connect with the circuit which has the terminal by which the above-mentioned contact probe is connected to each end face of pattern wiring, and this probe equipment is characterized by to have the contact probe pinching object which pinches the ferroelasticity film which is arranged on said film and projects from this film shorter than said contact pin, this ferroelasticity film, and said contact probe. Moreover, when said ferroelasticity film presses said contact pin, said film is formed in the tip side for a long time rather than said ferroelasticity film so that it may become shock absorbing material.

[0014] Since the point really fabricates a contact pin in the condition of having projected from the inferior surface of tongue of the body section to the perpendicular, for example, using a mask exposure technique as an operation of this invention, bending processing like before cannot be performed, but the dimension of the point of each contact pin can be made highly precise, the height of a point can be arranged with homogeneity, and polish like before becomes unnecessary. Moreover, when the pad is formed with the ingredient [elasticity / aluminum] (for example, gold), even if it arranges a contact pin in parallel to a pad side, it contacts certainly, without the inferior surface of tongue of the point of each contact pin removing only the oxide film of a pad, and attaching a blemish to a substrate only by applying an overdrive, without performing a scrub. Thus, since it is not necessary to carry out inclination arrangement of the contact probe, compared with the former, the structure of the components for incorporating a contact probe, a fixture, etc. is simplified, and processing becomes easy. Furthermore, since the point of a contact pin is formed with the ingredient harder than the body section, while the abrasion resistance of this point improves and the life of the whole contact pin is prolonged, it becomes easy to eat into a pad. And since said point is made into the configuration to which the cross section becomes small gradually towards the lower limit, even if it is the case where a contact pin is arranged in parallel to a pad side, for example, at the time of an overdrive, local stylus pressure is high, and tends to bite to a pad, consequently said point can tear the scaling film of aluminum good.

[0015] The contact probe produced by the manufacture approach of this invention can respond to all pads by changing and forming the amount of protrusions of each contact pin from a film point according to each pad distance also to the pad group from which the distance from a film point to each pad differs a contact pin to a pad side since it can arrange in parallel. And the contact angle over each pad of each contact pin can be made the same in that case.

[0016] In this contact probe, even if it is the resin film which said film absorbs moisture and tends to elongate, since a metal film is stuck directly and it is prepared, the elongation of said film is controlled by this film with this metal film. Therefore, the pitch of a contact pin does not shift by the elongation of a film, and the positive contact to each pad can be taken.

[0017] In this contact probe, since the 2nd film is directly stuck on said metal film and is

prepared in it, the operation effectiveness of becoming shock absorbing material to bolting at the time of inclusion of the contact probe by various components is acquired. Therefore, the damage given to a circuit pattern at the time of inclusion can be made to mitigate. Moreover, if it is in the thing for LCD, short-circuit with a metal film and the terminal of TABIC can be prevented.
[0018] With this probe equipment, in order that said ferroelasticity film may be prepared and this ferroelasticity film may press down the tip of a contact pin from the upper part, even if that to which the pin tip curved up exists, a pad can be made to be able to contact certainly and the measurement mistake by the poor contact can be lost from the place where uniform contact pressure is obtained by each pin. In this case, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle and the thing to which said pin tip curved up especially exist between this contact pin and a pad side when the contact pin in which said heights were formed is arranged in parallel for example, to a pad side, that anxiety does not exist with this probe equipment.
[0019] Since it becomes shock absorbing material when said film is formed in a tip side for a long time rather than said ferroelasticity film and this ferroelasticity film presses a contact pin, even if it applies a repeat overdrive, the contact which the contact pin was distorted by friction with a ferroelasticity film, did not curve, and was stabilized to the pad can be maintained. In this case, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle, the thing which curved at said pin especially exist between this contact pin and a pad side when a contact pin is arranged in parallel for example, to a pad side, that anxiety does not exist with this probe equipment.
[0020]
[Embodiment of the Invention] Next, the example of this invention is explained with reference to a drawing. Hereafter, the 1st operation gestalt of the manufacture approach of the contact probe concerning this invention is explained, referring to drawing 1 thru/or drawing 13 .
[0021] The basic configuration of the contact probe 1 of this operation gestalt has structure which stuck the pattern wiring 3 formed in one side of the polyimide resin film 2 with a metal, and the tip of said pattern wiring 3 projects it from the edge of said resin film 2, and it is set to contact pin 3a as shown in said drawing 29 . Here, the description of this operation gestalt is a point which point (ball of product made from tungsten in this example) 3T of contact pin 3a have projected perpendicularly below to body section 3K, as shown in drawing 9 .
[0022] Next, with reference to drawing 1 thru/or drawing 9 , the making process of said contact probe 1 is explained in order of a process.
[0023] [A support metal plate and metal layer formation process] First, as shown in drawing 1 , the base metal layer (1st metal layer) 6 is formed by Cu (copper) plating on the support metal plate 5 made from stainless steel (substrate layer). This base metal layer 6 is formed in the top face of the support metal plate 5 by the thickness of homogeneity.
[0024] [The 1st pattern formation process and 1st exposure process] Next, after forming the 1st photoresist layer (the 1st mask) 7 on this base metal layer 6, the 1st photo mask 8 of the predetermined pattern which has two or more partial 8a which does not make light penetrate on the 1st photoresist layer 7 is given using a photoengraving-process technique. Partial 8a (although five are illustrated in drawing 1 , it does not restrict to this) which does not make these light penetrate is for being arranged at equal intervals and forming point 3T of contact pin 3a.
[0025] Here, as it exposes and is shown in drawing 2 , the 1st photoresist layer 7 is developed and opening 7a is formed in the part covered by partial 8a which does not make the light of the 1st photoresist layer 7 penetrate, respectively. Then, the 1st photo mask 8 is removed.
[0026] In this operation gestalt, although the 1st photoresist layer 7 is formed by the negative-mold photoresist, a positive type photoresist may be adopted and desired opening 7a may be formed. Moreover, in this operation gestalt, said 1st photoresist layer 7 is equivalent to the "1st mask" said to this application claim. However, it is not necessarily limited to that in which opening 7a is formed through exposure / development process using the 1st photo mask 8 like the 1st photoresist layer 7 of this operation gestalt with the "1st mask" of this application claim. For example, the film (that is, beforehand formed in the condition which shows with the sign 7 of

drawing 2) with which the hole was beforehand formed in the part by which plating processing is carried out is sufficient. In this application claim, when using such a film etc. as "the 1st mask", the pattern formation process in this operation gestalt is unnecessary. The same is said of the 2nd mask 9 mentioned later. Let the location which forms this opening 7a be a location equivalent to point (contact section) 3T to the pad (measuring object object) P of contact pin 3a formed of nickel or the nickel alloy layer N (2nd metal layer) at a subsequent process.
[0027] [Point insertion process] And as shown in drawing 3 (a), by performing Cu half etching, a part of opening 7a of the 1st photoresist layer 7 of the base metal layer 6 and corresponding part are removed, and crevice 6a is formed. As shown in drawing 3 (b), the ball B made from a tungsten is inserted in each opening 7a, and it pushes against said crevice 6a. The magnitude of this ball B is set up so that it may insert in opening 7a strongly, and the front face is coarse. The quality of the material of Ball B should just be a conductive ingredient harder (whenever [wear] is small) than not only a tungsten but the quality of the material of body section 3K of contact pin 3a and. As shown in drawing 3 (c), the 2nd metal layer N1 with which contact pin 3a is presented is formed in each opening 7a by plating processing. Here, since Ball B does not turn caudad and the surface roughness of said ball B is set up coarsely, the 2nd metal layer N1 is high [Ball B] while it is supported by the base metal layer 6 at stability. [of the bond strength of Ball B and the 2nd metal layer N1] In addition, when the 2nd photoresist layer 9 mentioned later consists of a film like this example and this 2nd resist layer 9 does not enter in opening 7a, it is not necessary to necessarily perform this plating down stream processing. Moreover, instead of performing the ball insertion process of drawing 3 (b), as shown in drawing 3 (d), the needle H made from a tungsten is inserted in the base metal layer 6, and it is good also considering this as a point of a contact pin.
[0028] [The 2nd pattern formation process and 2nd exposure process] As shown in drawing 4 (a) and (b), the 2nd photoresist layer (the 2nd mask) 9 is formed on said 1st photoresist layer 7, and 2nd photo-mask 10b of a predetermined pattern which has further two or more partial 10a which does not make light penetrate on the 2nd photoresist layer 9 using a photoengraving-process technique is given. Partial 10a which does not make these light penetrate is mutually prolonged in parallel in regular intervals, and is for forming body section 3K of contact pin 3a. In addition, the end section of partial 10a which does not make light penetrate is formed in the location which laps with opening 7a of said 1st photoresist layer 7. Then, by exposing, as shown in drawing 5 (a) and (b), opening (slot) 9a is formed in the part covered by partial 10a which does not make said light of the 2nd photoresist layer 9 penetrate, respectively, and 2nd photo-mask 10a is removed. Each opening 9 is formed in the location where the end section laps with opening 7a of the 1st photoresist layer 7.
[0029] [Like electrolysis galvanizer] As shown in drawing 6 , the 2nd metal layer N with which contact pin 3a is presented is formed in each opening 9a of the 2nd photoresist layer 9 by plating processing. That is, nickel used as said pattern wiring 3 or the nickel alloy layer N is formed in each opening 9a by plating processing. Thereby, point 3T (ball B) project perpendicularly below the pattern wiring 3 (contact pin 3a) which becomes by nickel or the nickel alloy layer N from those body section 3K, and these point 3T become the contact section to a pad. Then, as shown in drawing 7 , the 2nd photoresist layer 9 is removed.
[0030] [Film covering process] Next, in addition to the tip of said pattern wiring 3 shown in drawing 29 , i.e., the part used as contact pin 3a, as shown in drawing 8 , it is on said nickel or the nickel alloy layer N, and said resin film 2 is pasted up by adhesives 2a. This resin film 2 is the two layer tape with which the metal film (copper foil) 500 was formed in polyimide resin PI at one. Even before this film covering process, it gold-plates by the application after copper etching, the ground side is formed at the copper surface 500 of the two layer tapes, and the resin side PI of the two layer tapes is made to put on said nickel or the nickel alloy layer N through adhesives 2a at this film covering process. In addition, in addition to copper foil, nickel, nickel alloy, etc. are sufficient as the metal film 500.
[0031] [Separation process] And after making the support metal plate 5 separate from the part which consists of the resin film 2, pattern wiring 3, and a base metal layer 6 as shown in drawing 9 (a) and (b), it considers as the condition of having pasted up only the pattern wiring 3 on the

resin film 2, through Cu etching.
[0032] [Golden coating process] Next, Au plating is performed to the pattern wiring 3 of an exposure, and Au deposit A is formed in a front face. At this time, the Au layer A is formed in the whole front face covering the perimeter by said contact pin 3a which projected from the resin film 2 and was made into the condition.
[0033] The contact probe 1 which pasted up the pattern wiring 3 on the resin film 2 as shown in drawing 11 and drawing 12 according to the above process is produced.
[0034] It is drawing showing what drawing 11 used said contact probe 1 as IC probe, and started in the predetermined configuration, and drawing 12 is the C-C line sectional view of drawing 11 . As shown in drawing 11 and drawing 12 , the aperture 11 for telling the signal acquired from the pattern wiring 3 to a printed circuit board 20 (referring to drawing 10) through the wiring 10 for drawers is formed in the resin film 2.
[0035] As shown in drawing 12 , said metal film 500 is formed to near the contact pin 3a, and, as for contact pin 3a, the amount L of protrusions from the point of the metal film 500 is set to 5mm or less. This metal film 500 can be used as a ground, the design of it which takes impedance matching to near the tip of probe equipment (probe card) 70 is attained by that cause, and also when performing the test in a RF region, it can prevent the bad influence by the reflective noise.
[0036] Moreover, there are the following advantages in the metal film 500 stuck on the resin film 2 (polyimide resin PI) further. That is, since the resin film 2 consisted of polyimide resin when there is no metal film 500, as moisture was absorbed, elongation arose and it was shown in drawing 13 , the spacing t between contact pin 3a and 3a might change. Therefore, contact pin 3a could not contact the predetermined location of a pad, but there was a problem that an exact electric test could not be performed. With this operation gestalt, even if humidity changes to the resin film 2 by sticking the metal film 500, change of said spacing t is lessened, and contact pin 3a is certainly contacted in the predetermined location of a pad.
[0037] only applying an overdrive, even if it is the case where the contact probe 1 is arranged in parallel to the pad side Pa since said point 3T are formed in the contact section to the pad at said contact pin 3a for example, as shown in drawing 10 -- this -- point 3T contact certainly to Pad P. Compared with the former which needed to carry out inclination arrangement of the contact probe 1, the structure of the components 31 for incorporating the contact probe 1, a fixture, etc. is simplified, and processing becomes easy from this. Specifically, the simple configuration of pasting up the contact probe 1 on components 31 also enables it to incorporate.

[0038] When performing the probe test of IC chip etc. using the probe equipment 70 constituted as mentioned above By connecting with a circuit tester electrically, while equipping a prober with probe equipment 70, and sending a predetermined electrical signal to IC chip on a wafer from contact pin 3a of the pattern wiring 3 The output signal from this IC chip is transmitted to a circuit tester through a substrate from contact pin 3a, and the electrical characteristics of IC chip are measured.
[0039] in this case -- since those point 3T project to a perpendicular and really fabricate contact pin 3a in the condition from the inferior surface of tongue which is body section 3K -- each -- the dimension of point 3T -- highly precise -- carrying out -- each -- the height of point 3T can be arranged and the polish which time and effort like before and time amount require becomes unnecessary. Moreover, since the height and spacing of point 3T of contact pin 3a become homogeneity, in case each terminal of semiconductor chips, such as a chip and an LSI chip, or a liquid crystal panel is made to contact, the amount of overdrives flows certainly at least, and contact precision is high. Furthermore, when the pad is formed with the ingredient [elasticity / aluminum] (for example, gold), even if it arranges contact pin 3a in parallel to a pad side, it contacts certainly only by applying an overdrive, without attaching a blemish to a substrate, without performing a scrub. Thus, since it is not necessary to carry out inclination arrangement of the contact probe, compared with the former, the structure of the components for incorporating a contact probe, a fixture, etc. is simplified, and processing becomes easy. And since stylus pressure can be made high and it eats away to a pad by making the amount of

overdrives increase even if it arranges a contact probe in parallel to a pad side, good contact can be obtained. That is, when the pad is formed with the comparatively hard quality of the materials, such as aluminum, only the oxide film of aluminum can be removed by making stylus pressure high at the time of an overdrive. Since point 3T of contact pin 3a are formed with the ingredient (this example tungsten) harder than body section 3K, while this abrasion resistance of point 3T improves and the life of the whole contact pin 3a is prolonged, it becomes easy to eat into a pad. Since said point 3T are made into the configuration to which the cross section becomes small gradually towards the lower limit, even if it is the case where contact pin 3a is arranged in parallel to the pad side Pa, for example, at the time of an overdrive, local stylus pressure is high, and tends to bite to Pad P, consequently said point 3T can tear the scaling film of aluminum good.

[0040] Furthermore, although the scrub was required for the contact probe produced by the above-mentioned conventional manufacture approach in order for the inferior-surface-of-tongue 3b to obtain good contact since it was flat as shown in drawing 30 , and contact pin 3a was made to incline and it needed to arrange According to the configuration which makes contact pin 3a of the former concerned project in a slanting lower part Although it can respond to the pad (for example, plane view was carried out and arranged in the shape of [parallel to film point 2k] straight line) P group by which the distance from film point 2k to each pad P was arranged equally It was not able to respond to the pad P with which the distance from film point 2k to each pads P and P2 differs (for example, arranged in the shape of a plane view hound's-tooth check), and P2 group.

[0041] Because, since contact pin 3a projects along with film plane 2e from film point 2k (to film plane 2e and parallel), Although the contact angle theta of each contact pin 3a and each pad P can be fixed in the conventional configuration which a film 2 (contact probe 1) is made to incline, and is arranged if the distance from film point 2k to each pad P is equal When said distance differs, a structure top is difficult, furthermore the configurations in which each contact pin 3a-- is contacted to all those pads P and P2 -- are each pads P and P2 in that case. -- It is because the contact angle theta cannot be kept constant.

[0042] On the other hand, the contact probe 1 produced by the manufacture approach of this operation gestalt As shown in drawing 10 , the pad side Pa is received in contact pin 3a. Since it can arrange in parallel, Also as opposed to the pad P with which the distance from film point 2k to each pads P and P2 differs, and P2 group It can respond to all the pads P and P2 -- by changing and forming each contact pin 3a from film point 2k, and the amount of protrusions of three a2 according to each pad P and P2 distance. And each contact pin 3a and the contact angle over each pads P and P2 of three a2 can be made into identitas (perpendicular with this operation gestalt) in that case.

[0043] In addition, in the 1st operation gestalt, although the contact probe 1 was applied to the probe equipment 70 which is a probe card, you may adopt it as other fixtures for measurement etc. For example, IC chip may be held and protected inside and you may apply to the socket for IC chip test carried in the equipment for a burn-in test of IC chip etc. Moreover, although the contact probe has been arranged so that it may be in a level condition, as shown not only in this but in drawing 30 and drawing 31 , it may arrange aslant, and a scrub may be performed.

[0044] Next, the 2nd operation gestalt is explained with reference to drawing 14 thru/or drawing 19 . The contact probe 1 (refer to drawing 11) cut down in the predetermined configuration for IC probes in the 1st operation gestalt is replaced with it, and this operation gestalt cuts down and uses it for the predetermined configuration of the probe for LCD. The contact probe cut down by the probe for LCD is shown to drawing 14 thru/or 16 by the sign 200, and a sign 201 is a resin film.

[0045] As shown in drawing 17 , the probe equipment 100 for LCD (probe equipment) It has the structure which comes to fix the contact probe pinching object 110 and this contact probe pinching object 110 to the frame-like frame 120 (although two or more contact probe pinching objects 110 were attached in fact, only one was illustrated here). The tip of contact pin 3a projected from this contact probe pinching object 110 contacts the terminal (not shown) of LCD (liquid crystal display object)90.

[0046] As shown in drawing 16 , the contact probe pinching object 110 is equipped with the top clamp 111 and the bottom clamp 115. The top clamp 111 has the 3rd projection 114 which presses down the 1st projection 112 which presses down the tip of contact pin 3a, the 2nd projection 113 which presses down the terminal 301 by the side of TABIC (circuit)300 which is a driver IC, and a lead.
[0047] The contact probe 200 is laid after the bottom clamp 115, and it lays so that the terminal 301 of TABIC300 may be further located between the resin films 201,201 of the contact probe 200. Then, the 1st projection 112 is on the resin film 201, and the top clamp 111 is put so that the 1st projection 113 may contact a terminal 301, and it is assembled with a bolt.
[0048] As shown in drawing 18 , the contact probe pinching object 110 is produced by incorporating the contact probe 200 and combining the top clamp 111 and the bottom clamp 115 with a bolt 130.
[0049] The electric test of LCD90 using the probe equipment 100 for LCD is in the condition of having contacted the tip of contact pin 3a of the probe equipment 100 for LCD for the terminal (not shown) of LCD90, and is performed by taking out outside the signal which was made to drive TABIC300 and was acquired from contact pin 3a in response to delivery and this signal in the various signals for a test through TABIC300. In addition, since only ON-OFF is tested in the case of LCD90, especially a RF property is not made into a problem compared with the test of said IC.
[0050] Also in the above-mentioned probe equipment 100 for LCD, as shown in drawing 19 , even if it is the case where the contact probe 200 is arranged in parallel to the terminal side of LCD90, point 3T contact certainly to a terminal only by applying an overdrive, for example. Compared with the former, the structure of the components (for example, bottom clamp 115) for incorporating the contact probe 200, a fixture, etc. is simplified, and processing becomes easy from this. It faces incorporating the contact probe 200 and it becomes possible to carry out with the simple configuration of, making components (for example, top clamp 111) paste etc. for example.
[0051] Next, the gestalt of the 3rd operation is explained with reference to drawing 20 thru/or drawing 22 . As shown in drawing 20 , the tip S1 where the tip curved to the upper part other than the normal tip S, and the tip S2 which curved caudad might produce contact pin 3a in the contact probe 200 explained in the gestalt of implementation of the above 2nd. In this case, as shown in drawing 21 , even if it pinched the above-mentioned resin film 201 by the 1st projection 112 and bottom clamp 115 and forced contact pin 3a on the terminal of LCD90, although the normal tip S1 and the tip S2 which curved caudad contacted the terminal of LCD90, even if the tip S1 which curved up contacted, sufficient contact pressure might not be obtained. From this, the poor contact to LCD90 of contact pin 3a occurred, and an exact electric test might be unable to be performed. Moreover, although the amount of forcing of contact pin 3a was made to fluctuate in order to obtain desired contact pressure at the time of a test, there is a limit in the amount from the configuration of a needle of that for which the big amount of forcing is needed in order to obtain big contact pressure, and big contact pressure could not be obtained.
[0052] Then, as shown in drawing 20 thru/or drawing 22 , in order to align the tip S1 which curved above contact pin 3a, and the tip S2 which curved caudad with the normal tip S with the gestalt of the 3rd operation, The ferroelasticity film 400 which becomes the upper part of the resin film 201 from organic or an inorganic material So that it may project shorter than this contact pin 3a on the near resin film 201 with which contact pin 3a projects Superposition, The contact probe pinching object 110 which comes to pinch the contact probe 200 and the ferroelasticity film 400 by the 1st projection 112 and bottom clamp 115 of the top clamp 111 was adopted in the condition. In this case, that tip side turns caudad, and is bent and the ferroelasticity film 400 presses the tip S1 which curved up.
[0053] In addition, as for the ferroelasticity film 400, it is desirable to consist of polyethylene terephthalate etc., if it is an organic material, and to consist of ceramics, especially a film made from an alumina, if it is an inorganic material. Moreover, in arranging contact pin 3a in parallel with the terminal side of LCD90 like this operation gestalt, the tip side of said ferroelasticity film 400 is turned caudad, and it bends it so that the tip S1 which curved up can be pressed suitably,

but when making contact pin 3a incline to said terminal side and arranging, even if it does not bend the ferroelasticity film 400, said tip S1 can be pressed.
[0054] If this contact probe pinching object 110 is fixed to the frame-like frame 120 (refer to drawing 17) and contact pin 3a is pressed against the terminal of LCD90, the ferroelasticity film 400 presses down contact pin 3a from the upper part, and even if it is the tip S1 which curved to said upper part, the terminal of LCD90 will be contacted certainly. Uniform contact pressure is obtained by each contact pin 3a by this, and the measurement mistake by the poor contact can be lost.
[0055] Furthermore, by changing the amount of protrusions of contact pin 3a from the ferroelasticity film 400, when contact pin 3a is forced, it becomes possible to change the timing which presses down contact pin 3a from a top, and desired contact pressure can be obtained in the desired amount of forcing.
[0056] In the case of the probe equipment 100 for LCD in the operation gestalt of the above 3rd, as shown in drawing 22 , contact pin 3a For example, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle and the thing S1 to which said pin tip curved up especially exist between this contact pin 3a and a terminal side when it arranges in parallel to a terminal side The anxiety does not exist with this probe equipment 100.
[0057] Next, the 4th operation gestalt is explained with reference to drawing 23 and drawing 24 . As shown in drawing 23 , while adopting the configuration which sticks the metal film 500 on the resin film 201, and sticks the 2nd resin film 202 further on it, as shown in drawing 24 , the ferroelasticity film 400 is formed on this 2nd resin film 202. Here, the 2nd resin film 202 was formed for preventing short-circuit with the metal film 500 and the terminal 301 of TABIC300, when a terminal 301 was pressed down by the projection 113 of the top clamp 111 in order to connect the contact probe 200 and the terminal 301 of TABIC300. Moreover, by forming the 2nd resin film 202, the front face of the metal film 500 will be covered and advance of oxidation in atmospheric air can be suppressed effectively.
[0058] Next, the 5th operation gestalt is explained with reference to drawing 25 and drawing 26 . With the operation gestalt mentioned above, when the ferroelasticity film 400 is carrying out press contact at contact pin 3a, friction of the ferroelasticity film 400 and contact pin 3a was repeated by use of a repeat and distortion by this was accumulated, contact pin 3a might bend right and left, and the point of contact might shift.
[0059] So, with the 5th operation gestalt, as shown in drawing 25 , while setting said resin film 201 to film 201a broader than before, the configuration which will set the wire extension from the metal film 500 of contact pin 3a to X1>X2 if the wire extension from the metal film 500 of X1 and broad resin film 201a is set to X2 was adopted. And if said ferroelasticity film 400 is used in piles so that it may project shorter than Hiroki Haba fat film 201a as shown in drawing 26 , since the ferroelasticity film 400 contacts soft Hiroki Haba fat film 201a and does not contact contact pin 3a directly, it can prevent that contact pin 3a bends right and left.
[0060] With the probe equipment 100 for LCD in the above-mentioned 5th operation gestalt, since it becomes shock absorbing material when said broad film 201a is formed in a tip side for a long time rather than said ferroelasticity film 400 and this ferroelasticity film 400 presses contact pin 3a, even if it applies a repeat overdrive, the contact which contact pin 3a was distorted by friction with the ferroelasticity film 400, did not curve, and was stabilized to the terminal can be maintained. In this case, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle, the thing which curved to said pin 3a especially exist between this contact pin 3a and a terminal side when contact pin 3a is arranged in parallel for example, to a terminal side as shown in drawing 26 , that anxiety does not exist with this probe equipment 100.
[0061] Next, the gestalt of the 6th operation is explained with reference to drawing 27 and drawing 28 . The 2nd resin film 202 is stuck on the metal film 500, and if the wire extension from the metal film 500 of contact pin 3a is set to X2 in that case, the wire extension from the metal film 500 of X1 and broad resin film 201a is constituted so that it may become the relation of X1>X2. And you may make it pile up the ferroelasticity film 400 prepared on the 2nd resin film

202 so that it may project shorter than broad resin film 201a as shown in drawing 28 .
[0062]
[Effect of the Invention] Since this invention is constituted as it was explained above, it does so effectiveness which is indicated below. Since, as for the contact probe and its manufacture approach of this invention, the point really fabricates a contact pin in the condition of having projected from the inferior surface of tongue of the body section to the perpendicular, the dimension of said point can be made highly precise, the height of a point can be arranged in each pin, and polish like before becomes unnecessary. As a result, contact precision improves, and there are few amounts of overdrives and they end. Moreover, when the pad is formed with the elasticity ingredient (for example, gold) as compared with aluminum, a contact probe is arranged in parallel to a pad side, and good conductivity can be secured only by applying an overdrive, without the point of a contact pin contacting a pad and attaching a blemish to a substrate. From this, compared with the former, the structure of the components for incorporating a contact probe, a fixture, etc. is simplified, and processing can be made easy. Furthermore, since stylus pressure can be made high and it eats away to a pad by making the amount of overdrives increase even if the inferior surface of tongue of the point of a contact pin is a flat surface, good contact can be obtained. Since the point of a contact pin is formed with the ingredient harder than the body section, the abrasion resistance of this point improves and the life of the whole contact pin is prolonged. And since said point is made into the configuration to which the cross section becomes small gradually towards the lower limit, even if it is the case where a contact pin is arranged in parallel to a pad side, for example, at the time of an overdrive, local stylus pressure is high, and tends to bite to a pad, consequently said point can tear the scaling film of aluminum good. The thickness of the 1st metal layer can adjust the height of the point of a contact pin easily. While a ball (or needle) is supported by the base metal layer by making the front face of a ball or a needle coarse beforehand at stability, the bond strength of a ball (or needle) and the 2nd metal layer becomes high.
[0063] Moreover, since a metal film is stuck directly and prepared, even if it is the resin film which said film absorbs moisture and tends to elongate, the elongation of said film is controlled by said film with this metal film. Therefore, the pitch of a contact pin does not shift by the elongation of a film, and the positive contact to each pad can be taken.
[0064] Furthermore, since the 2nd film is directly stuck on said metal film and is prepared in it, the effectiveness of becoming shock absorbing material to bolting at the time of inclusion of the contact probe by various components is acquired. Therefore, the damage given to a circuit pattern at the time of inclusion can be made to mitigate. Moreover, if it is in the thing for LCD, short-circuit with a metal film and the terminal of TABIC can be prevented.
[0065] According to the probe equipment of this invention, in order that a ferroelasticity film may press down the tip of a contact pin from the upper part, even if that to which the pin tip curved up exists, a pad can be made to be able to contact certainly and the measurement mistake by the poor contact can be lost from the place where uniform contact pressure is obtained by each pin. In this case, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle and the thing to which said pin tip curved up especially exist between this contact pin and a pad side when a contact pin is arranged in parallel for example, to a pad side, that fear does not exist with this probe equipment.
[0066] Moreover, since it becomes shock absorbing material when said film is formed in a tip side for a long time rather than said ferroelasticity film and this ferroelasticity film presses a contact pin, even if it applies a repeat overdrive, the contact which the contact pin was distorted by friction with a ferroelasticity film, did not curve, and was stabilized to the pad can be maintained. In this case, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle, the thing which curved at said pin especially exist between this contact pin and a pad side when a contact pin is arranged in parallel for example, to a pad side, that fear does not exist with this probe equipment.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention is used as a probe pin, a socket pin, etc., and relates to the manufacture approach of a contact probe of contacting each terminal, such as a semiconductor IC chip and a liquid crystal device, and performing an electric test.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The contact pin is used, in order to make each terminal of semiconductor chips, such as IC chip and an LSI chip, or LCD (liquid crystal display object) contact and to perform an electric test generally. While the contact pad which is an electrode is formed into a ** pitch with high integration and detailed-izing of IC chip etc. in recent years, multi-pin ** pitch-ization of a contact pin is demanded. However, in the contact probe of the tungsten needle used as a contact pin, the correspondence to a multi-pin ** pitch from the limitation of the path of a tungsten needle was difficult.
[0003] On the other hand, as shown in drawing 29 , two or more pattern wiring 3 is formed on the resin film 2, and the technique of the contact probe 1 in which each tip of these pattern wiring 3 projects from said resin film 2, is allotted to a condition, and is set to contact pin 3a is proposed (for example, JP,7-82027,B). In this technical example, multi-pin ** pitch-ization is attained by setting the tip of two or more pattern wiring 3 to contact pin 3a.
[0004] Generally, each terminal (pad), such as IC chip formed with aluminum (aluminum) alloy etc., is in the condition that the front face oxidized in air and was covered by the thin scaling film of aluminum. Therefore, in order to perform the electric test of a pad, it is necessary to make the scaling film of said aluminum exfoliate, to expose internal aluminum, and to secure conductivity. Then, he grinds the scaling film of the aluminum on the front face of a pad against the point of contact pin 3a, and is trying to expose internal aluminum by applying an overdrive in said contact probe 1, contacting contact pin 3a on the surface of a pad. This activity is called a scrub (scrub).
[0005] By the way, manufacture of said contact probe 1 is performed through the following processes.
** Perform coppering to the top face of a stainless plate.
** Form a resist mask (mask) in this copper layer, and perform exposure and development through a photo mask.
** Perform nickel plating to the part by which a resist mask is not carried out, and form said pattern wiring 3.
** Make said resin film 2 put on the top face of the part except the point set to said contact pin 3a among this pattern wiring 3.
** Make the part which consists of this resin film 2, pattern wiring 3, and said copper layer, and said stainless plate separate.
** Remove a part to said copper layer from this resin film 2 and the pattern wiring 3, and produce said contact probe 1.
[0006] According to the above-mentioned manufacture approach, inferior-surface-of-tongue 3b of said contact pin 3a is formed evenly. For this reason, if said contact pin 3a is arranged so that that axis may become parallel to a pad side, even if it carries out an overdrive, it is only contacting in parallel and this pad side and said flat inferior-surface-of-tongue 3b cannot grind the scaling film of aluminum good. From this, as shown in drawing 30 , it inclined and said contact pin 3a was arranged so that it might have the fixed contact angle theta to the pad side Pa.
[0007] In order to arrange said contact pin 3a, holding said contact angle theta, the various components 30 and 50, a fixture, etc. for doing the predetermined angle theta inclination of said

contact probe 1, and incorporating it are needed. Since these various components 30 and 50, fixtures, etc. are configurations incorporated in the condition of having made the contact probe 1 inclining, they become complicated [structure] compared with the thing in which the contact probe 1 is made to only lay horizontally. Furthermore, if said contact angle theta affects greatly scrub distance (die length which shaves off a coat along a putt front face), and the depth and this contact angle theta depends it how at the time of a scrub Since the point of contact pin 3a overflows Pad P or damages the pad P itself at the time of a scrub, sufficient precision to secure the accuracy of the contact angle theta is required of said components 30 and 50, and processing is difficult for them.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] Since this invention is constituted as it was explained above, it does so effectiveness which is indicated below. Since, as for the contact probe and its manufacture approach of this invention, the point really fabricates a contact pin in the condition of having projected from the inferior surface of tongue of the body section to the perpendicular, the dimension of said point can be made highly precise, the height of a point can be arranged in each pin, and polish like before becomes unnecessary. As a result, contact precision improves, and there are few amounts of overdrives and they end. Moreover, when the pad is formed with the elasticity ingredient (for example, gold) as compared with aluminum, a contact probe is arranged in parallel to a pad side, and good conductivity can be secured only by applying an overdrive, without the point of a contact pin contacting a pad and attaching a blemish to a substrate. From this, compared with the former, the structure of the components for incorporating a contact probe, a fixture, etc. is simplified, and processing can be made easy. Furthermore, since stylus pressure can be made high and it eats away to a pad by making the amount of overdrives increase even if the inferior surface of tongue of the point of a contact pin is a flat surface, good contact can be obtained. Since the point of a contact pin is formed with the ingredient harder than the body section, the abrasion resistance of this point improves and the life of the whole contact pin is prolonged. And since said point is made into the configuration to which the cross section becomes small gradually towards the lower limit, even if it is the case where a contact pin is arranged in parallel to a pad side, for example, at the time of an overdrive, local stylus pressure is high, and tends to bite to a pad, consequently said point can tear the scaling film of aluminum good. The thickness of the 1st metal layer can adjust the height of the point of a contact pin easily. While a ball (or needle) is supported by the base metal layer by making the front face of a ball or a needle coarse beforehand at stability, the bond strength of a ball (or needle) and the 2nd metal layer becomes high.

[0063] Moreover, since a metal film is stuck directly and prepared, even if it is the resin film which said film absorbs moisture and tends to elongate, the elongation of said film is controlled by said film with this metal film. Therefore, the pitch of a contact pin does not shift by the elongation of a film, and the positive contact to each pad can be taken.

[0064] Furthermore, since the 2nd film is directly stuck on said metal film and is prepared in it, the effectiveness of becoming shock absorbing material to bolting at the time of inclusion of the contact probe by various components is acquired. Therefore, the damage given to a circuit pattern at the time of inclusion can be made to mitigate. Moreover, if it is in the thing for LCD, short-circuit with a metal film and the terminal of TABIC can be prevented.

[0065] According to the probe equipment of this invention, in order that a ferroelasticity film may press down the tip of a contact pin from the upper part, even if that to which the pin tip curved up exists, a pad can be made to be able to contact certainly and the measurement mistake by the poor contact can be lost from the place where uniform contact pressure is obtained by each pin. In this case, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle and the thing to which said pin tip curved up especially exist between this contact pin and a pad side when a contact pin is arranged in parallel for example, to a pad side, that fear does not exist with this probe equipment.

[0066] Moreover, since it becomes shock absorbing material when said film is formed in a tip side for a long time rather than said ferroelasticity film and this ferroelasticity film presses a contact pin, even if it applies a repeat overdrive, the contact which the contact pin was distorted by friction with a ferroelasticity film, did not curve, and was stabilized to the pad can be maintained. In this case, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle, the thing which curved at said pin especially exist between this contact pin and a pad side when a contact pin is arranged in parallel for example, to a pad side, that fear does not exist with this probe equipment.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, it is necessary to prevent that face performing a scrub and a contact pin damages to the pad not only the scaling film of the aluminum on the front face of a pad but under it (substrate) itself. In order to prevent that the substrate of a pad gets damaged at the time of a scrub, to secure the contact angle over the pad of a contact pin to sufficient magnitude is needed. Because, when a contact angle is small, it is from the reason for the amount of removal of surface aluminum becoming remarkably large, and affecting even a pad substrate. Then, as shown in drawing 31 , using a fixture (un-illustrating), and bending point 3T of contact pin 3a so that it may become an abbreviation perpendicular to the contact surface P is considered.
[0009] However, since there is surely dispersion in the height and spacing of a point which the contact pin bent (i.e., since a non-set occurs in a pin lower limit), in case each terminal of semiconductor chips, such as a chip and an LSI chip, or a liquid crystal panel is made to contact, the condition of having not flowed arises and contact precision is bad. Moreover, if the amount of overdrives is made to increase, when the pad is especially formed with the elasticity ingredient (for example, gold) as compared with aluminum, the trouble that a blemish is attached is in a pad substrate. In addition, although the tip of a contact pin can be arranged by polish, this takes time and effort and a long time, and a patient throughput becomes low. Furthermore, although said contact pin covers that whole and is formed of the same quality of the material, if it tends to wear especially a point out and this abrasion loss exceeds the amount of conventions, the whole contact probe must be exchanged and it will also become the thing of a contact pin which a running cost increases.
[0010] While being made in view of the above-mentioned situation and polish being unnecessary, the height at the tip of each contact pin is arranged, each contact pin contacts coincidence at a pad in the case of an overdrive, contact precision of this invention is high, and it aims at providing with probe equipment the contact probe which reduces wear of the point of a contact pin and a running cost reduces and its manufacture approach, and a list.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] The contact probe of this invention for attaining the above-mentioned purpose It is the contact probe which two or more pattern wiring is formed on a film, and each tip of these pattern wiring projects from said film, is arranged on a condition, and is used as a contact pin. Said contact pin is really fabricated, after the point has projected perpendicularly below to the body section, and it is characterized by forming said point with the conductive ingredient harder than said body section and. Moreover, said point is made into the configuration to which the cross section becomes small gradually towards the lower limit. Furthermore, said point is the ball or needle made from a tungsten. And the 2nd film shall be directly stuck on what a metal film is directly stuck on said film, and is prepared in it, and said metal film, and shall be prepared in them.
[0012] The metal layer formation process with which the manufacture approach of the contact probe of this invention forms the 1st metal layer which consists of the quality of the material put or combined with the point of a contact pin on a substrate layer, The 1st pattern formation process which forms opening for giving the 1st mask on the 1st metal layer, and inserting the point of said contact pin in this 1st mask, The point which consists of a conductive ingredient harder than the body section of said contact pin and is inserted in said opening. The 2nd mask is given on the point insertion process forced on said 1st metal layer, and the 1st metal layer. The 2nd pattern formation process which forms opening for forming the body section of said contact pin in this 2nd mask so that that end section may lap at said opening of said 1st mask, Plating down stream processing which forms in each opening of said 1st mask, and each opening of the 2nd mask the 2nd metal layer with which a contact pin is presented by plating processing, The covering process which puts the film which covers except the part with which said contact pin is presented on the 2nd metal layer except the 2nd mask, It is characterized by having the separation process which separates the part which consists of said substrate layer, the 1st [said] metal layer, and the 1st mask from the part which consists of said film and said 2nd metal layer. Moreover, said point is a ball or a needle. Furthermore, the process which forms the 2nd metal layer in each opening of said 1st mask may be performed after said point insertion process. And the front face of said ball or a needle is processed coarsely beforehand.
[0013] The probe equipment of this invention is probe equipment which it comes to connect with the circuit which has the terminal by which the above-mentioned contact probe is connected to each end face of pattern wiring, and this probe equipment is characterized by to have the contact probe pinching object which pinches the ferroelasticity film which is arranged on said film and projects from this film shorter than said contact pin, this ferroelasticity film, and said contact probe. Moreover, when said ferroelasticity film presses said contact pin, said film is formed in the tip side for a long time rather than said ferroelasticity film so that it may become shock absorbing material.
[0014] Since the point really fabricates a contact pin in the condition of having projected from the inferior surface of tongue of the body section to the perpendicular, for example, using a mask exposure technique as an operation of this invention, bending processing like before cannot be performed, but the dimension of the point of each contact pin can be made highly precise, the height of a point can be arranged with homogeneity, and polish like before becomes unnecessary.

Moreover, when the pad is formed with the ingredient [elasticity / aluminum] (for example, gold), even if it arranges a contact pin in parallel to a pad side, it contacts certainly, without the inferior surface of tongue of the point of each contact pin removing only the oxide film of a pad, and attaching a blemish to a substrate only by applying an overdrive, without performing a scrub. Thus, since it is not necessary to carry out inclination arrangement of the contact probe, compared with the former, the structure of the components for incorporating a contact probe, a fixture, etc. is simplified, and processing becomes easy. Furthermore, since the point of a contact pin is formed with the ingredient harder than the body section, while the abrasion resistance of this point improves and the life of the whole contact pin is prolonged, it becomes easy to eat into a pad. And since said point is made into the configuration to which the cross section becomes small gradually towards the lower limit, even if it is the case where a contact pin is arranged in parallel to a pad side, for example, at the time of an overdrive, local stylus pressure is high, and tends to bite to a pad, consequently said point can tear the scaling film of aluminum good.

[0015] The contact probe produced by the manufacture approach of this invention can respond to all pads by changing and forming the amount of protrusions of each contact pin from a film point according to each pad distance also to the pad group from which the distance from a film point to each pad differs a contact pin to a pad side since it can arrange in parallel. And the contact angle over each pad of each contact pin can be made the same in that case.

[0016] In this contact probe, even if it is the resin film which said film absorbs moisture and tends to elongate, since a metal film is stuck directly and it is prepared, the elongation of said film is controlled by this film with this metal film. Therefore, the pitch of a contact pin does not shift by the elongation of a film, and the positive contact to each pad can be taken.

[0017] In this contact probe, since the 2nd film is directly stuck on said metal film and is prepared in it, the operation effectiveness of becoming shock absorbing material to bolting at the time of inclusion of the contact probe by various components is acquired. Therefore, the damage given to a circuit pattern at the time of inclusion can be made to mitigate. Moreover, if it is in the thing for LCD, short-circuit with a metal film and the terminal of TABIC can be prevented.

[0018] With this probe equipment, in order that said ferroelasticity film may be prepared and this ferroelasticity film may press down the tip of a contact pin from the upper part, even if that to which the pin tip curved up exists, a pad can be made to be able to contact certainly and the measurement mistake by the poor contact can be lost from the place where uniform contact pressure is obtained by each pin. In this case, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle and the thing to which said pin tip curved up especially exist between this contact pin and a pad side when the contact pin in which said heights were formed is arranged in parallel for example, to a pad side, that anxiety does not exist with this probe equipment.

[0019] Since it becomes shock absorbing material when said film is formed in a tip side for a long time rather than said ferroelasticity film and this ferroelasticity film presses a contact pin, even if it applies a repeat overdrive, the contact which the contact pin was distorted by friction with a ferroelasticity film, did not curve, and was stabilized to the pad can be maintained. In this case, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle, the thing which curved at said pin especially exist between this contact pin and a pad side when a contact pin is arranged in parallel for example, to a pad side, that anxiety does not exist with this probe equipment.

[0020]

[Embodiment of the Invention] Next, the example of this invention is explained with reference to a drawing. Hereafter, the 1st operation gestalt of the manufacture approach of the contact probe concerning this invention is explained, referring to drawing 1 thru/or drawing 13 .

[0021] The basic configuration of the contact probe 1 of this operation gestalt has structure which stuck the pattern wiring 3 formed in one side of the polyimide resin film 2 with a metal, and the tip of said pattern wiring 3 projects it from the edge of said resin film 2, and it is set to contact pin 3a as shown in said drawing 29 . Here, the description of this operation gestalt is a point which point (ball of product made from tungsten in this example) 3T of contact pin 3a have

projected perpendicularly below to body section 3K, as shown in drawing 9 .
[0022] Next, with reference to drawing 1 thru/or drawing 9 , the making process of said contact probe 1 is explained in order of a process.
[0023] [A support metal plate and metal layer formation process] First, as shown in drawing 1 , the base metal layer (1st metal layer) 6 is formed by Cu (copper) plating on the support metal plate 5 made from stainless steel (substrate layer). This base metal layer 6 is formed in the top face of the support metal plate 5 by the thickness of homogeneity.
[0024] [The 1st pattern formation process and 1st exposure process] Next, after forming the 1st photoresist layer (the 1st mask) 7 on this base metal layer 6, the 1st photo mask 8 of the predetermined pattern which has two or more partial 8a which does not make light penetrate on the 1st photoresist layer 7 is given using a photoengraving-process technique. Partial 8a (although five are illustrated in drawing 1 , it does not restrict to this) which does not make these light penetrate is for being arranged at equal intervals and forming point 3T of contact pin 3a.
[0025] Here, as it exposes and is shown in drawing 2 , the 1st photoresist layer 7 is developed and opening 7a is formed in the part covered by partial 8a which does not make the light of the 1st photoresist layer 7 penetrate, respectively. Then, the 1st photo mask 8 is removed.
[0026] In this operation gestalt, although the 1st photoresist layer 7 is formed by the negative-mold photoresist, a positive type photoresist may be adopted and desired opening 7a may be formed. Moreover, in this operation gestalt, said 1st photoresist layer 7 is equivalent to the "1st mask" said to this application claim. However, it is not necessarily limited to that in which opening 7a is formed through exposure / development process using the 1st photo mask 8 like the 1st photoresist layer 7 of this operation gestalt with the "1st mask" of this application claim. For example, the film (that is, beforehand formed in the condition which shows with the sign 7 of drawing 2) with which the hole was beforehand formed in the part by which plating processing is carried out is sufficient. In this application claim, when using such a film etc. as "the 1st mask", the pattern formation process in this operation gestalt is unnecessary. The same is said of the 2nd mask 9 mentioned later. Let the location which forms this opening 7a be a location equivalent to point (contact section) 3T to the pad (measuring object object) P of contact pin 3a formed of nickel or the nickel alloy layer N (2nd metal layer) at a subsequent process.
[0027] [Point insertion process] And as shown in drawing 3 (a), by performing Cu half etching, a part of opening 7a of the 1st photoresist layer 7 of the base metal layer 6 and corresponding part are removed, and crevice 6a is formed. As shown in drawing 3 (b), the ball B made from a tungsten is inserted in each opening 7a, and it pushes against said crevice 6a. The magnitude of this ball B is set up so that it may insert in opening 7a strongly, and the front face is coarse. The quality of the material of Ball B should just be a conductive ingredient harder (whenever [wear] is small) than not only a tungsten but the quality of the material of body section 3K of contact pin 3a and. As shown in drawing 3 (c), the 2nd metal layer N1 with which contact pin 3a is presented is formed in each opening 7a by plating processing. Here, since Ball B does not turn caudad and the surface roughness of said ball B is set up coarsely, the 2nd metal layer N1 is high [Ball B] while it is supported by the base metal layer 6 at stability. [of the bond strength of Ball B and the 2nd metal layer N1] In addition, when the 2nd photoresist layer 9 mentioned later consists of a film like this example and this 2nd resist layer 9 does not enter in opening 7a, it is not necessary to necessarily perform this plating down stream processing. Moreover, instead of performing the ball insertion process of drawing 3 (b), as shown in drawing 3 (d), the needle H made from a tungsten is inserted in the base metal layer 6, and it is good also considering this as a point of a contact pin.
[0028] [The 2nd pattern formation process and 2nd exposure process] As shown in drawing 4 (a) and (b), the 2nd photoresist layer (the 2nd mask) 9 is formed on said 1st photoresist layer 7, and 2nd photo-mask 10b of a predetermined pattern which has further two or more partial 10a which does not make light penetrate on the 2nd photoresist layer 9 using a photoengraving-process technique is given. Partial 10a which does not make these light penetrate is mutually prolonged in parallel in regular intervals, and is for forming body section 3K of contact pin 3a. In addition, the end section of partial 10a which does not make light penetrate is formed in the location

which laps with opening 7a of said 1st photoresist layer 7. Then, by exposing, as shown in drawing 5 (a) and (b), opening (slot) 9a is formed in the part covered by partial 10a which does not make said light of the 2nd photoresist layer 9 penetrate, respectively, and 2nd photo-mask 10a is removed. Each opening 9 is formed in the location where the end section laps with opening 7a of the 1st photoresist layer 7.
[0029] [Like electrolysis galvanizer] As shown in drawing 6 , the 2nd metal layer N with which contact pin 3a is presented is formed in each opening 9a of the 2nd photoresist layer 9 by plating processing. That is, nickel used as said pattern wiring 3 or the nickel alloy layer N is formed in each opening 9a by plating processing. Thereby, point 3T (ball B) project perpendicularly below the pattern wiring 3 (contact pin 3a) which becomes by nickel or the nickel alloy layer N from those body section 3K, and these point 3T become the contact section to a pad. Then, as shown in drawing 7 , the 2nd photoresist layer 9 is removed.
[0030] [Film covering process] Next, in addition to the tip of said pattern wiring 3 shown in drawing 29 , i.e., the part used as contact pin 3a, as shown in drawing 8 , it is on said nickel or the nickel alloy layer N, and said resin film 2 is pasted up by adhesives 2a. This resin film 2 is the two layer tape with which the metal film (copper foil) 500 was formed in polyimide resin PI at one. Even before this film covering process, it gold-plates by the application after copper etching, the ground side is formed at the copper surface 500 of the two layer tapes, and the resin side PI of the two layer tapes is made to put on said nickel or the nickel alloy layer N through adhesives 2a at this film covering process. In addition, in addition to copper foil, nickel, nickel alloy, etc. are sufficient as the metal film 500.
[0031] [Separation process] And after making the support metal plate 5 separate from the part which consists of the resin film 2, pattern wiring 3, and a base metal layer 6 as shown in drawing 9 (a) and (b), it considers as the condition of having pasted up only the pattern wiring 3 on the resin film 2, through Cu etching.
[0032] [Golden coating process] Next, Au plating is performed to the pattern wiring 3 of an exposure, and Au deposit-A is formed in a front face. At this time, the Au layer A is formed in the whole front face covering the perimeter by said contact pin 3a which projected from the resin film 2 and was made into the condition.
[0033] The contact probe 1 which pasted up the pattern wiring 3 on the resin film 2 as shown in drawing 11 and drawing 12 according to the above process is produced.
[0034] It is drawing showing what drawing 11 used said contact probe 1 as IC probe, and started in the predetermined configuration, and drawing 12 is the C-C line sectional view of drawing 11 . As shown in drawing 11 and drawing 12 , the aperture 11 for telling the signal acquired from the pattern wiring 3 to a printed circuit board 20 (referring to drawing 10) through the wiring 10 for drawers is formed in the resin film 2.
[0035] As shown in drawing 12 , said metal film 500 is formed to near the contact pin 3a, and, as for contact pin 3a, the amount L of protrusions from the point of the metal film 500 is set to 5mm or less. This metal film 500 can be used as a ground, the design of it which takes impedance matching to near the tip of probe equipment (probe card) 70 is attained by that cause, and also when performing the test in a RF region, it can prevent the bad influence by the reflective noise.
[0036] Moreover, there are the following advantages in the metal film 500 stuck on the resin film 2 (polyimide resin PI) further. That is, since the resin film 2 consisted of polyimide resin when there is no metal film 500, as moisture was absorbed, elongation arose and it was shown in drawing 13 , the spacing t between contact pin 3a and 3a might change. Therefore, contact pin 3a could not contact the predetermined location of a pad, but there was a problem that an exact electric test could not be performed. With this operation gestalt, even if humidity changes to the resin film 2 by sticking the metal film 500, change of said spacing t is lessened, and contact pin 3a is certainly contacted in the predetermined location of a pad.
[0037] only applying an overdrive, even if it is the case where the contact probe 1 is arranged in parallel to the pad side Pa since said point 3T are formed in the contact section to the pad at said contact pin 3a for example, as shown in drawing 10 -- this -- point 3T contact certainly to Pad P. Compared with the former which needed to carry out inclination arrangement of the

contact probe 1, the structure of the components 31 for incorporating the contact probe 1, a fixture, etc. is simplified, and processing becomes easy from this. Specifically, the simple configuration of pasting up the contact probe 1 on components 31 also enables it to incorporate.

[0038] When performing the probe test of IC chip etc. using the probe equipment 70 constituted as mentioned above By connecting with a circuit tester electrically, while equipping a prober with probe equipment 70, and sending a predetermined electrical signal to IC chip on a wafer from contact pin 3a of the pattern wiring 3 The output signal from this IC chip is transmitted to a circuit tester through a substrate from contact pin 3a, and the electrical characteristics of IC chip are measured.
[0039] in this case -- since those point 3T project to a perpendicular and really fabricate contact pin 3a in the condition from the inferior surface of tongue which is body section 3K -- each -- the dimension of point 3T -- highly precise -- carrying out -- each -- the height of point 3T can be arranged and the polish which time and effort like before and time amount require becomes unnecessary. Moreover, since the height and spacing of point 3T of contact pin 3a become homogeneity, in case each terminal of semiconductor chips, such as a chip and an LSI chip, or a liquid crystal panel is made to contact, the amount of overdrives flows certainly at least, and contact precision is high. Furthermore, when the pad is formed with the ingredient [elasticity / aluminum] (for example, gold), even if it arranges contact pin 3a in parallel to a pad side, it contacts certainly only by applying an overdrive, without attaching a blemish to a substrate, without performing a scrub. Thus, since it is not necessary to carry out inclination arrangement of the contact probe, compared with the former, the structure of the components for incorporating a contact probe, a fixture, etc. is simplified, and processing becomes easy. And since stylus pressure can be made high and it eats away to a pad by making the amount of overdrives increase even if it arranges a contact probe in parallel to a pad side, good contact can be obtained. That is, when the pad is formed with the comparatively hard quality of the materials, such as aluminum, only the oxide film of aluminum can be removed by making stylus pressure high at the time of an overdrive. Since point 3T of contact pin 3a are formed with the ingredient (this example tungsten) harder than body section 3K, while this abrasion resistance of point 3T improves and the life of the whole contact pin 3a is prolonged, it becomes easy to eat into a pad. Since said point 3T are made into the configuration to which the cross section becomes small gradually towards the lower limit, even if it is the case where contact pin 3a is arranged in parallel to the pad side Pa, for example, at the time of an overdrive, local stylus pressure is high, and tends to bite to Pad P, consequently said point 3T can tear the scaling film of aluminum good.
[0040] Furthermore, although the scrub was required for the contact probe produced by the above-mentioned conventional manufacture approach in order for the inferior-surface-of-tongue 3b to obtain good contact since it was flat as shown in drawing 30 , and contact pin 3a was made to incline and it needed to arrange According to the configuration which makes contact pin 3a of the former concerned project in a slanting lower part Although it can respond to the pad (for example, plane view was carried out and arranged in the shape of [parallel to film point 2k] straight line) P group by which the distance from film point 2k to each pad P was arranged equally It was not able to respond to the pad P with which the distance from film point 2k to each pads P and P2 differs (for example, arranged in the shape of a plane view hound's-tooth check), and P2 group.
[0041] Because, since contact pin 3a projects along with film plane 2e from film point 2k (to film plane 2e and parallel), Although the contact angle theta of each contact pin 3a and each pad P can be fixed in the conventional configuration which a film 2 (contact probe 1) is made to incline, and is arranged if the distance from film point 2k to each pad P is equal When said distance differs, a structure top is difficult, furthermore the configurations in which each contact pin 3a-- is contacted to all those pads P and P2 -- are each pads P and P2 in that case. -- It is because the contact angle theta cannot be kept constant.
[0042] On the other hand, the contact probe 1 produced by the manufacture approach of this operation gestalt As shown in drawing 10 , the pad side Pa is received in contact pin 3a. Since it

can arrange in parallel, Also as opposed to the pad P with which the distance from film point 2k to each pads P and P2 differs, and P2 group It can respond to all the pads P and P2 -- by changing and forming each contact pin 3a from film point 2k, and the amount of protrusions of three a2 according to each pad P and P2 distance. And each contact pin 3a and the contact angle over each pads P and P2 of three a2 can be made into identitas (perpendicular with this operation gestalt) in that case.

[0043] In addition, in the 1st operation gestalt, although the contact probe 1 was applied to the probe equipment 70 which is a probe card, you may adopt it as other fixtures for measurement etc. For example, IC chip may be held and protected inside and you may apply to the socket for IC chip test carried in the equipment for a burn-in test of IC chip etc. Moreover, although the contact probe has been arranged so that it may be in a level condition, as shown not only in this but in drawing 30 and drawing 31 , it may arrange aslant, and a scrub may be performed.

[0044] Next, the 2nd operation gestalt is explained with reference to drawing 14 thru/or drawing 19 . The contact probe 1 (refer to drawing 11) cut down in the predetermined configuration for IC probes in the 1st operation gestalt is replaced with it, and this operation gestalt cuts down and uses it for the predetermined configuration of the probe for LCD. The contact probe cut down by the probe for LCD is shown to drawing 14 thru/or 16 by the sign 200, and a sign 201 is a resin film.

[0045] As shown in drawing 17 , the probe equipment 100 for LCD (probe equipment) It has the structure which comes to fix the contact probe pinching object 110 and this contact probe pinching object 110 to the frame-like frame 120 (although two or more contact probe pinching objects 110 were attached in fact, only one was illustrated here). The tip of contact pin 3a projected from this contact probe pinching object 110 contacts the terminal (not shown) of LCD (liquid crystal display object)90.

[0046] As shown in drawing 16 , the contact probe pinching object 110 is equipped with the top clamp 111 and the bottom clamp 115. The top clamp 111 has the 3rd projection 114 which presses down the 1st projection 112 which presses down the tip of contact pin 3a, the 2nd projection 113 which presses down the terminal 301 by the side of TABIC (circuit)300 which is a driver IC, and a lead.

[0047] The contact probe 200 is laid after the bottom clamp 115, and it lays so that the terminal 301 of TABIC300 may be further located between the resin films 201,201 of the contact probe 200. Then, the 1st projection 112 is on the resin film 201, and the top clamp 111 is put so that the 1st projection 113 may contact a terminal 301, and it is assembled with a bolt.

[0048] As shown in drawing 18 , the contact probe pinching object 110 is produced by incorporating the contact probe 200 and combining the top clamp 111 and the bottom clamp 115 with a bolt 130.

[0049] The electric test of LCD90 using the probe equipment 100 for LCD is in the condition of having contacted the tip of contact pin 3a of the probe equipment 100 for LCD for the terminal (not shown) of LCD90, and is performed by taking out outside the signal which was made to drive TABIC300 and was acquired from contact pin 3a in response to delivery and this signal in the various signals for a test through TABIC300. In addition, since only ON-OFF is tested in the case of LCD90, especially a RF property is not made into a problem compared with the test of said IC.

[0050] Also in the above-mentioned probe equipment 100 for LCD, as shown in drawing 19 , even if it is the case where the contact probe 200 is arranged in parallel to the terminal side of LCD90, point 3T contact certainly to a terminal only by applying an overdrive, for example. Compared with the former, the structure of the components (for example, bottom clamp 115) for incorporating the contact probe 200, a fixture, etc. is simplified, and processing becomes easy from this. It faces incorporating the contact probe 200 and it becomes possible to carry out with the simple configuration of, making components (for example, top clamp 111) paste etc. for example.

[0051] Next, the gestalt of the 3rd operation is explained with reference to drawing 20 thru/or drawing 22 . As shown in drawing 20 , the tip S1 where the tip curved to the upper part other than the normal tip S, and the tip S2 which curved caudad might produce contact pin 3a in the

contact probe 200 explained in the gestalt of implementation of the above 2nd. In this case, as shown in drawing 21 , even if it pinched the above-mentioned resin film 201 by the 1st projection 112 and bottom clamp 115 and forced contact pin 3a on the terminal of LCD90, although the normal tip S1 and the tip S2 which curved caudad contacted the terminal of LCD90, even if the tip S1 which curved up contacted, sufficient contact pressure might not be obtained. From this, the poor contact to LCD90 of contact pin 3a occurred, and an exact electric test might be unable to be performed. Moreover, although the amount of forcing of contact pin 3a was made to fluctuate in order to obtain desired contact pressure at the time of a test, there is a limit in the amount from the configuration of a needle of that for which the big amount of forcing is needed in order to obtain big contact pressure, and big contact pressure could not be obtained.

[0052] Then, as shown in drawing 20 thru/or drawing 22 , in order to align the tip S1 which curved above contact pin 3a, and the tip S2 which curved caudad with the normal tip S with the gestalt of the 3rd operation, The ferroelasticity film 400 which becomes the upper part of the resin film 201 from organic or an inorganic material So that it may project shorter than this contact pin 3a on the near resin film 201 with which contact pin 3a projects Superposition, The contact probe pinching object 110 which comes to pinch the contact probe 200 and the ferroelasticity film 400 by the 1st projection 112 and bottom clamp 115 of the top clamp 111 was adopted in the condition. In this case, that tip side turns caudad, and is bent and the ferroelasticity film 400 presses the tip S1 which curved up.

[0053] In addition, as for the ferroelasticity film 400, it is desirable to consist of polyethylene terephthalate etc., if it is an organic material, and to consist of ceramics, especially a film made from an alumina, if it is an inorganic material. Moreover, in arranging contact pin 3a in parallel with the terminal side of LCD90 like this operation gestalt, the tip side of said ferroelasticity film 400 is turned caudad, and it bends it so that the tip S1 which curved up can be pressed suitably, but when making contact pin 3a incline to said terminal side and arranging, even if it does not bend the ferroelasticity film 400, said tip S1 can be pressed.

[0054] If this contact probe pinching object 110 is fixed to the frame-like frame 120 (refer to drawing 17) and contact pin 3a is pressed against the terminal of LCD90, the ferroelasticity film 400 presses down contact pin 3a from the upper part, and even if it is the tip S1 which curved to said upper part, the terminal of LCD90 will be contacted certainly. Uniform contact pressure is obtained by each contact pin 3a by this, and the measurement mistake by the poor contact can be lost.

[0055] Furthermore, by changing the amount of protrusions of contact pin 3a from the ferroelasticity film 400, when contact pin 3a is forced, it becomes possible to change the timing which presses down contact pin 3a from a top, and desired contact pressure can be obtained in the desired amount of forcing.

[0056] In the case of the probe equipment 100 for LCD in the operation gestalt of the above 3rd, as shown in drawing 22 , contact pin 3a For example, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle and the thing S1 to which said pin tip curved up especially exist between this contact pin 3a and a terminal side when it arranges in parallel to a terminal side The anxiety does not exist with this probe equipment 100.

[0057] Next, the 4th operation gestalt is explained with reference to drawing 23 and drawing 24 . As shown in drawing 23 , while adopting the configuration which sticks the metal film 500 on the resin film 201, and sticks the 2nd resin film 202 further on it, as shown in drawing 24 , the ferroelasticity film 400 is formed on this 2nd resin film 202. Here, the 2nd resin film 202 was formed for preventing short-circuit with the metal film 500 and the terminal 301 of TABIC300, when a terminal 301 was pressed down by the projection 113 of the top clamp 111 in order to connect the contact probe 200 and the terminal 301 of TABIC300. Moreover, by forming the 2nd resin film 202, the front face of the metal film 500 will be covered and advance of oxidation in atmospheric air can be suppressed effectively.

[0058] Next, the 5th operation gestalt is explained with reference to drawing 25 and drawing 26 . With the operation gestalt mentioned above, when the ferroelasticity film 400 is carrying out press contact at contact pin 3a, friction of the ferroelasticity film 400 and contact pin 3a was

repeated by use of a repeat and distortion by this was accumulated, contact pin 3a might bend right and left, and the point of contact might shift.
[0059] So, with the 5th operation gestalt, as shown in drawing 25 , while setting said resin film 201 to film 201a broader than before, the configuration which will set the wire extension from the metal film 500 of contact pin 3a to X1>X2 if the wire extension from the metal film 500 of X1 and broad resin film 201a is set to X2 was adopted. And if said ferroelasticity film 400 is used in piles so that it may project shorter than Hiroki Haba fat film 201a as shown in drawing 26 , since the ferroelasticity film 400 contacts soft Hiroki Haba fat film 201a and does not contact contact pin 3a directly, it can prevent that contact pin 3a bends right and left.
[0060] With the probe equipment 100 for LCD in the above-mentioned 5th operation gestalt, since it becomes shock absorbing material when said broad film 201a is formed in a tip side for a long time rather than said ferroelasticity film 400 and this ferroelasticity film 400 presses contact pin 3a, even if it applies a repeat overdrive, the contact which contact pin 3a was distorted by friction with the ferroelasticity film 400, did not curve, and was stabilized to the terminal can be maintained. In this case, although it is possible that contact becomes uncertain even if it carries out an overdrive if the part without an include angle, the thing which curved to said pin 3a especially exist between this contact pin 3a and a terminal side when contact pin 3a is arranged in parallel for example, to a terminal side as shown in drawing 26 , that anxiety does not exist with this probe equipment 100.
[0061] Next, the gestalt of the 6th operation is explained with reference to drawing 27 and drawing 28 . The 2nd resin film 202 is stuck on the metal film 500, and if the wire extension from the metal film 500 of contact pin 3a is set to X2 in that case, the wire extension from the metal film 500 of X1 and broad resin film 201a is constituted so that it may become the relation of X1>X2. And you may make it pile up the ferroelasticity film 400 prepared on the 2nd resin film 202 so that it may project shorter than broad resin film 201a as shown in drawing 28 .

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the important section perspective view showing the 1st exposure process in the 1st operation gestalt of the manufacture approach of the contact probe concerning this invention etc.
[Drawing 2] The perspective view after the 1st exposure process in the 1st operation gestalt of the manufacture approach of the contact probe which (a) requires for this invention, and (b) are X-X-ray sectional views of (a).
[Drawing 3] The ball insertion process in the 1st operation gestalt of the manufacture approach of the contact probe concerning this invention is shown, a half etching process and (b) show a ball pushing process, (c) shows plating down stream processing, and (a) is drawing showing the case where replaced (d) with the ball and a needle is used.
[Drawing 4] The perspective view showing the 2nd exposure process front in the 1st operation gestalt of the manufacture approach of the contact probe which (a) requires for this invention, and (b) are the Y-Y line sectional views of (a).
[Drawing 5] The perspective view showing the 2nd exposure process back in the 1st operation gestalt of the manufacture approach of the contact probe which (a) requires for this invention, and (b) are the Z-Z line sectional views of (a).
[Drawing 6] The electrolysis galvanizer in the 1st operation gestalt of the manufacture approach of the contact probe concerning this invention is a next sectional view.
[Drawing 7] It is the sectional view showing the condition of having removed the 2nd photoresist layer 9 from the condition of drawing 6 .
[Drawing 8] It is a sectional view after the film adhesion process in the 1st operation gestalt of the manufacture approach of the contact probe concerning ********.
[Drawing 9] (a) is the important section outline perspective view of the culmination in the 1st operation gestalt of the manufacture approach of the contact probe concerning this invention, and (b) is a sectional view.
[Drawing 10] It is the side elevation showing an example of the probe equipment incorporating the contact probe manufactured according to the 1st operation gestalt of the manufacture approach of the contact probe concerning this invention.
[Drawing 11] It is the top view showing the contact probe manufactured according to the 1st operation gestalt of the manufacture approach of the contact probe concerning this invention.
[Drawing 12] It is the C-C line sectional view of drawing 11 .
[Drawing 13] It is a front view for explaining a metal film in the 1st operation gestalt of the contact probe concerning this invention.
[Drawing 14] It is the perspective view showing the contact probe in the 2nd operation gestalt of the probe equipment concerning this invention.
[Drawing 15] It is the A-A line sectional view of drawing 14 .
[Drawing 16] It is the decomposition perspective view showing the contact probe pinching object in the 2nd operation gestalt of the probe equipment concerning this invention.
[Drawing 17] It is the perspective view showing the probe equipment in the 2nd operation gestalt of the probe equipment concerning this invention.

[Drawing 18] It is the perspective view showing the contact probe pinching object in the 2nd operation gestalt of the probe equipment concerning this invention.
[Drawing 19] It is the B-B line sectional view of drawing 17 .
[Drawing 20] It is the side elevation showing the conventional fault of a contact probe about the 3rd operation gestalt of the probe equipment concerning this invention.
[Drawing 21] It is the side elevation showing the conventional fault of probe equipment about the 3rd operation gestalt of the probe equipment concerning this invention.
[Drawing 22] It is the side elevation showing the probe equipment in the 3rd operation gestalt of the probe equipment concerning this invention.
[Drawing 23] It is the side elevation showing the contact probe in the 4th operation gestalt of the contact probe concerning this invention.
[Drawing 24] It is the side elevation showing the probe equipment in the 4th operation gestalt of the probe equipment concerning this invention.
[Drawing 25] It is the side elevation showing the contact probe in the 5th operation gestalt of the probe equipment concerning this invention.
[Drawing 26] It is the side elevation showing the probe equipment in the 5th operation gestalt of the probe equipment concerning this invention.
[Drawing 27] It is the side elevation showing the contact probe in the 6th operation gestalt of the probe equipment concerning this invention.
[Drawing 28] It is the side elevation showing the probe equipment in the 6th operation gestalt of the probe equipment concerning this invention.
[Drawing 29] It is the important section perspective view showing the conventional contact probe.
[Drawing 30] It is the side elevation showing an example of the probe equipment incorporating the conventional contact probe.
[Drawing 31] It is drawing showing the example which bent the tip of a contact pin in the conventional contact probe.
[Description of Notations]
1 Contact Probe
2 Film (Resin Film)
2a Adhesives
2e Film plane
2k Film point
3 Pattern Wiring
3a, three a2 Contact pin
3b Inferior surface of tongue
3K Body section
3T Point (contact section)
5 Substrate Layer (Support Metal Plate)
6 1st Metal Layer (Base Metal Layer)
6a Opening
7 1st Photoresist Layer (1st Mask)
7a The part by which a mask is not carried out (opening)
8a The 1st photo mask
9 2nd Photoresist Layer (2nd Mask)
9a Opening
10 Wiring for Drawers
10b The 2nd photo mask
11 Aperture
20 Substrate (Printed Circuit Board)
30, 31, 50 Components
70 Probe Equipment (Probe Card)
90 LCD
100 Probe Equipment

110 Contact Probe Pinching Object
111 Top Clamp
112 1st Projection
113 2nd Projection
114 3rd Projection
115 Bottom Clamp
120 Frame-like Frame
130 Bolt
200 Contact Probe
201 Film
201a Film (broad film)
202 2nd Film
300 Circuit (TABIC)
301 Terminal
400 Ferroelasticity Film
500 Metal Film
N The 2nd metal layer (nickel or nickel alloy layer)
P, P2 Pad
Pa Pad side
S, S1, S2 Tip
theta Contact angle

[Translation done.]

* NOTICES *

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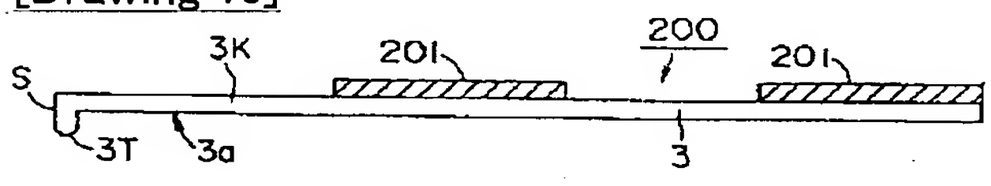
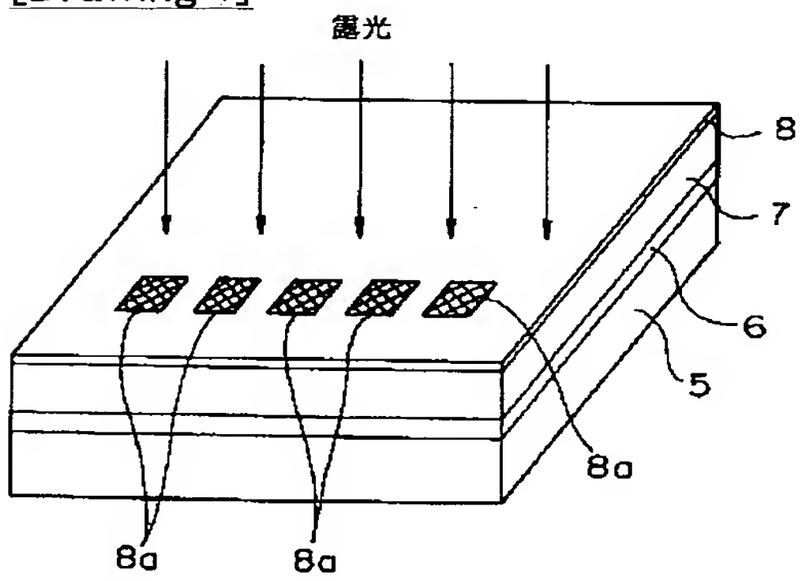
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 15]

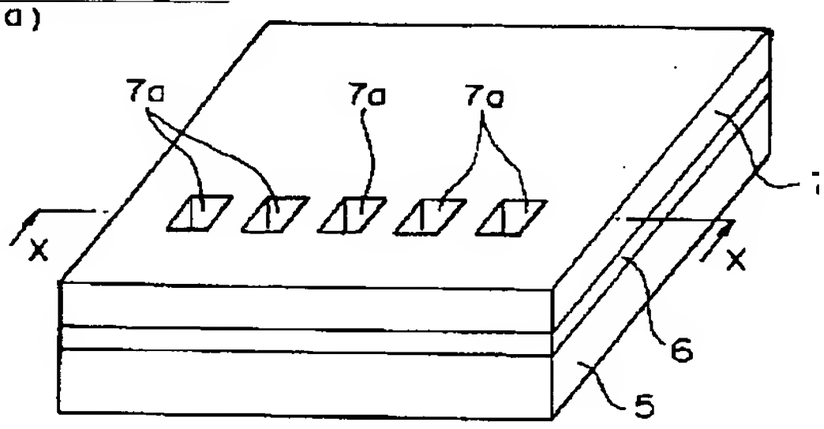


[Drawing 1]



[Drawing 2]

(a)



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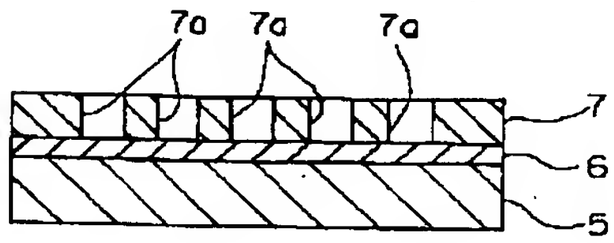
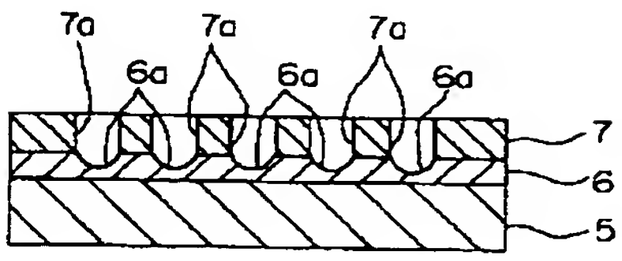


[Drawing 3]

(a)



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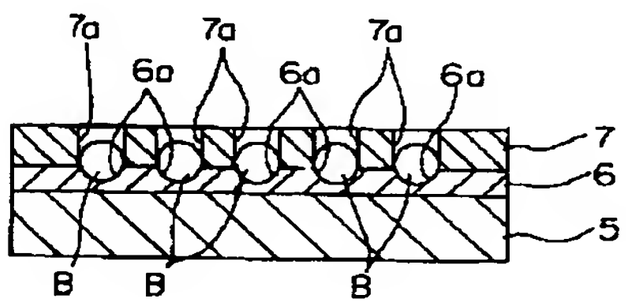

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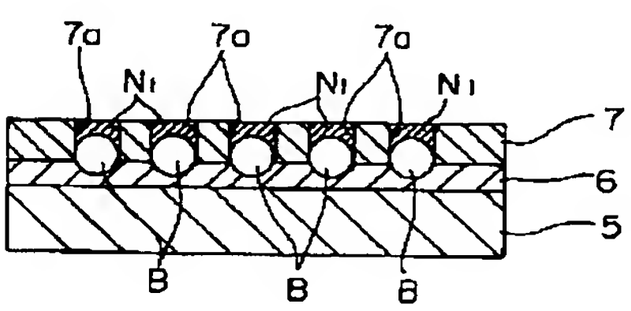

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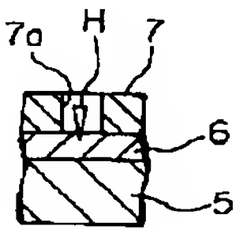
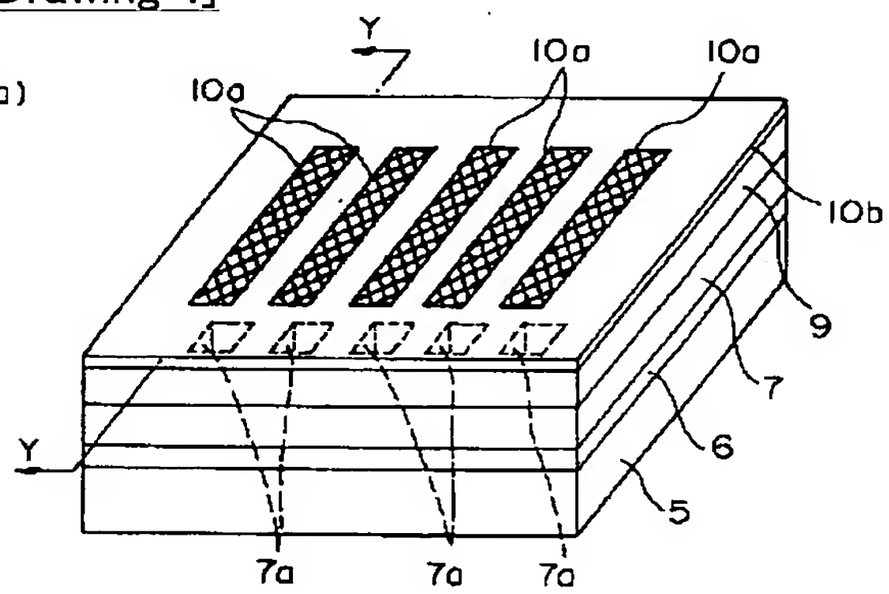


[Drawing 4]

(a)



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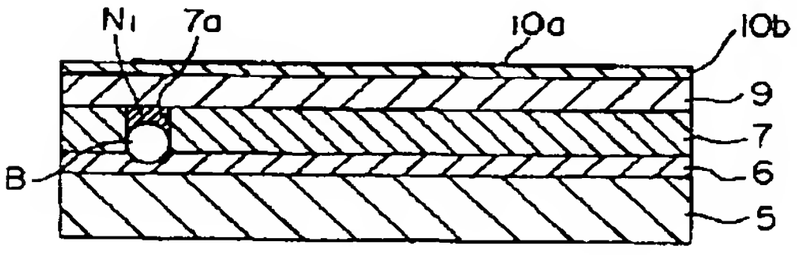

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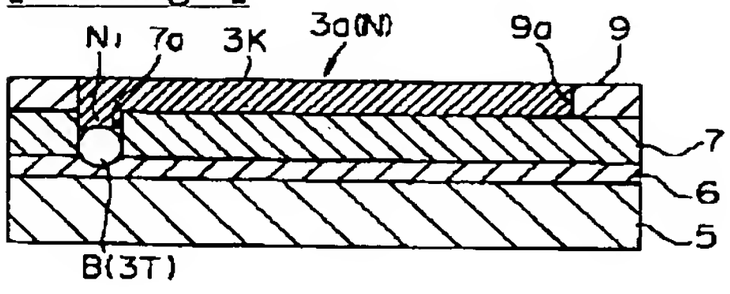

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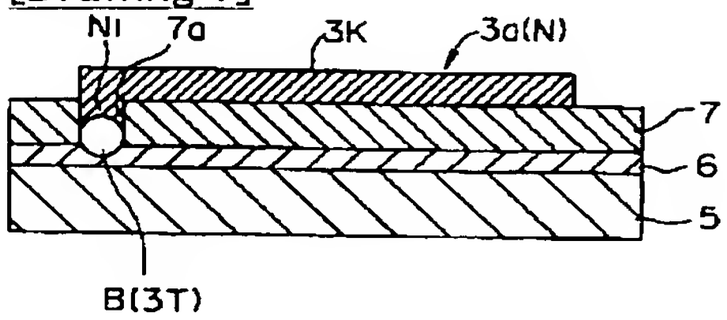
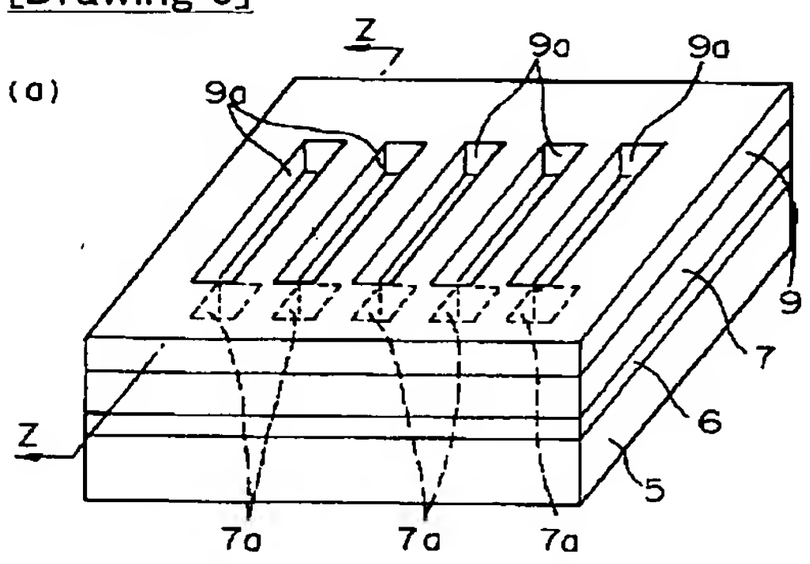


[Drawing 5]



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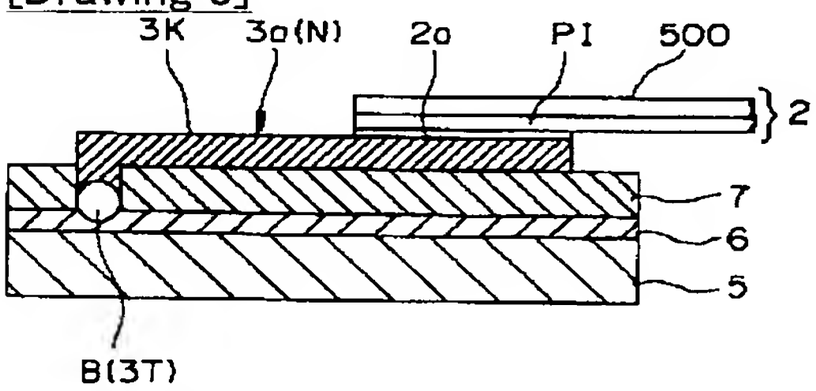

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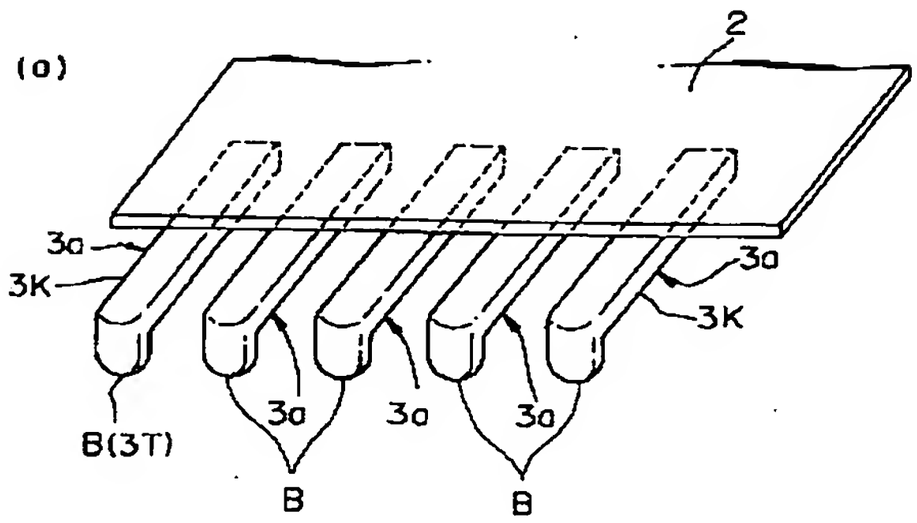
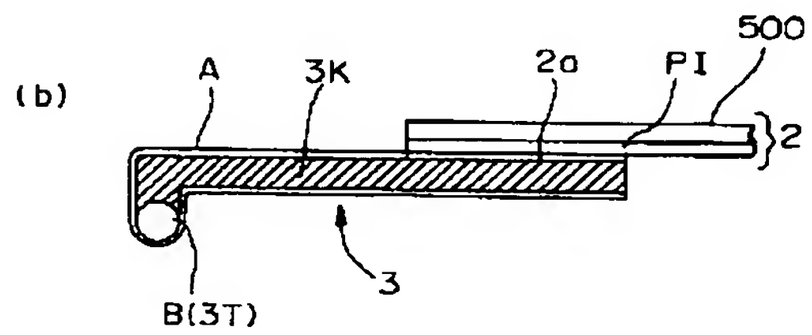
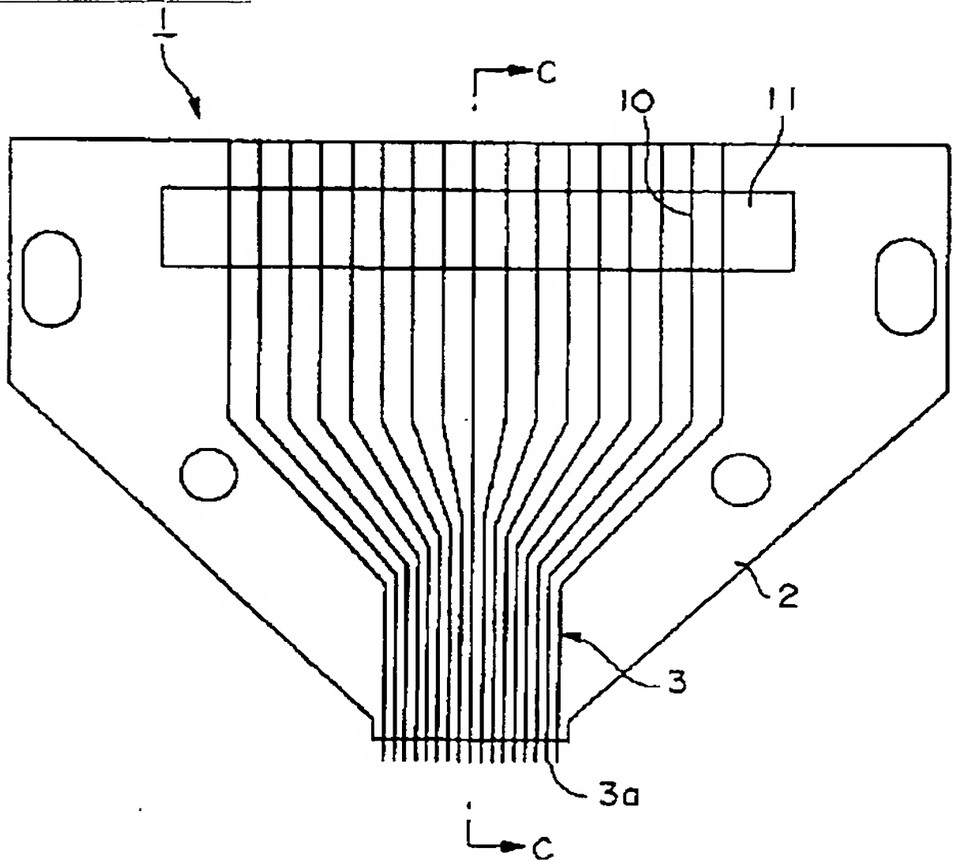




[Drawing 11]



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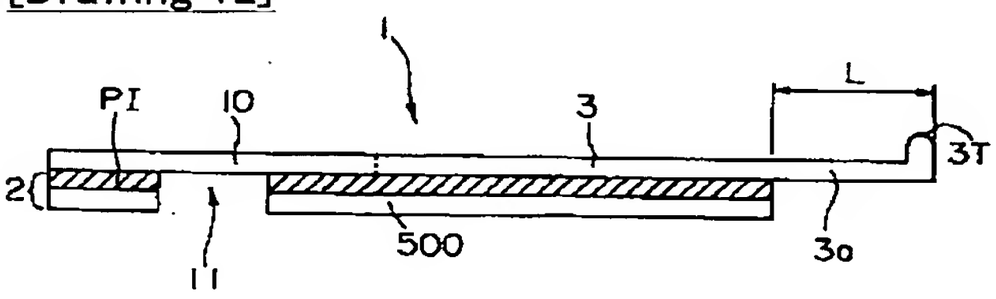
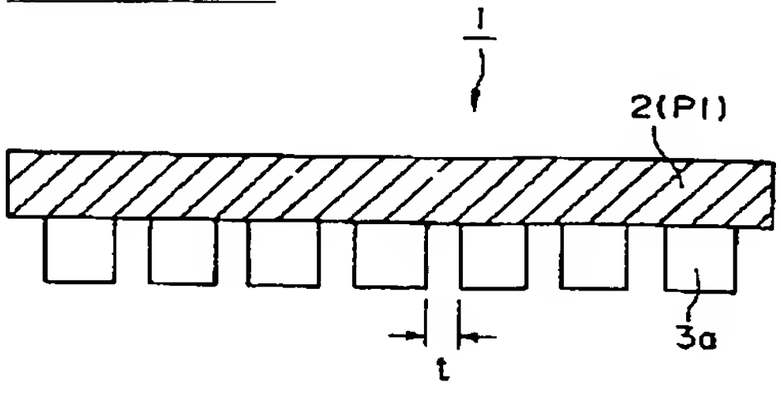


[Drawing 13]



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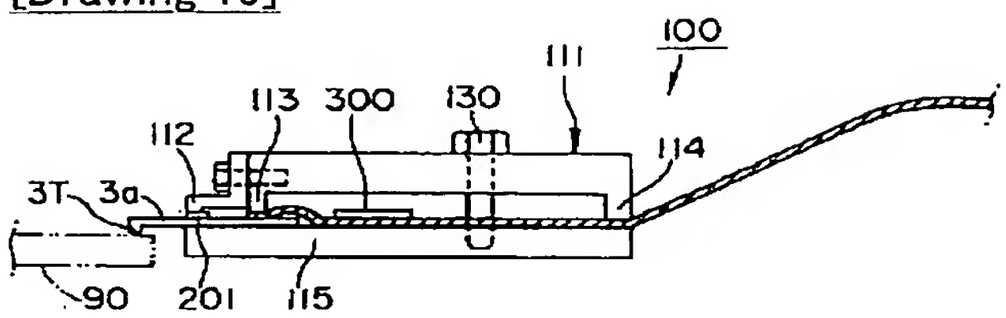

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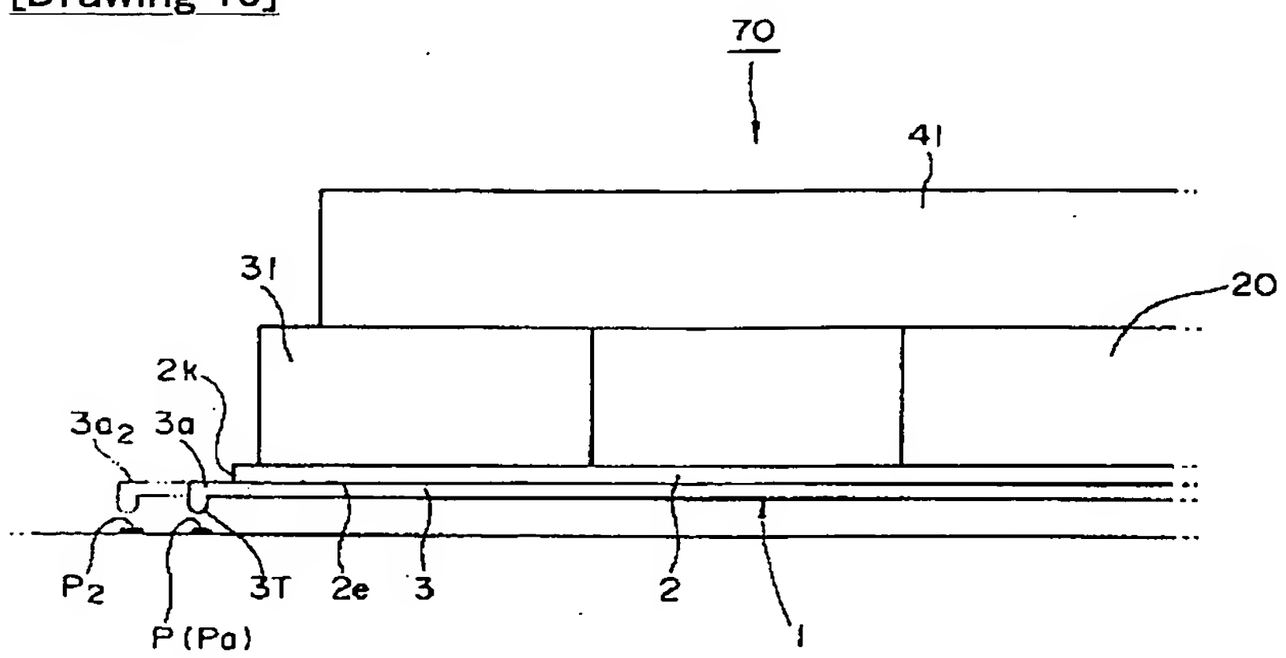

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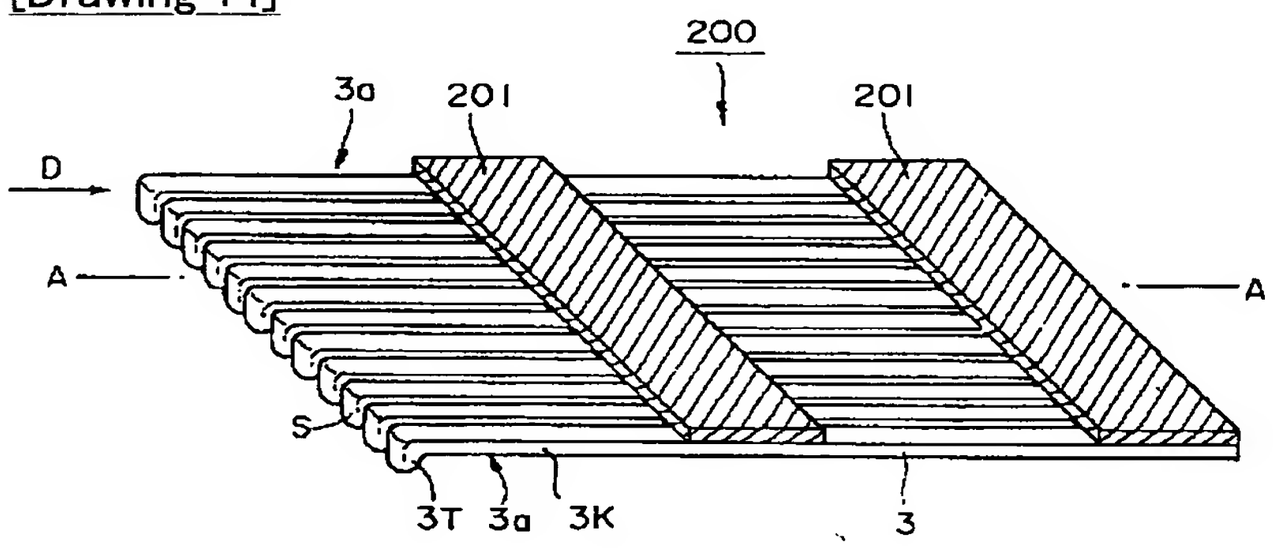
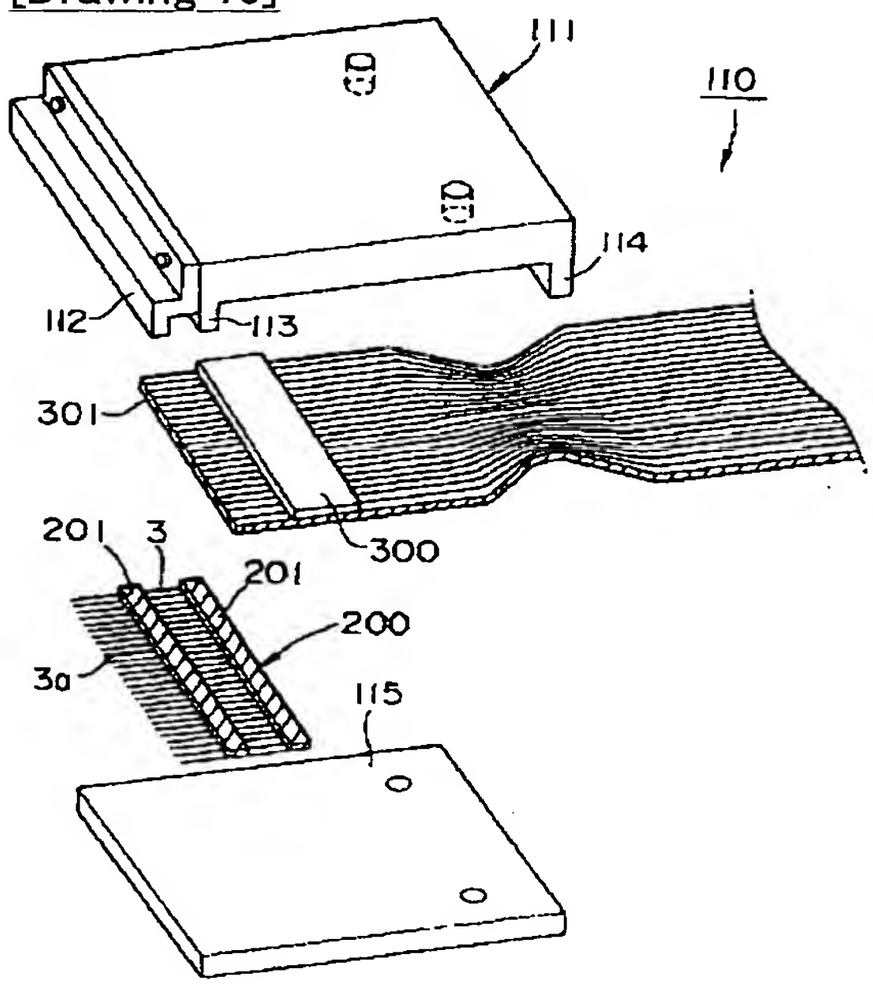
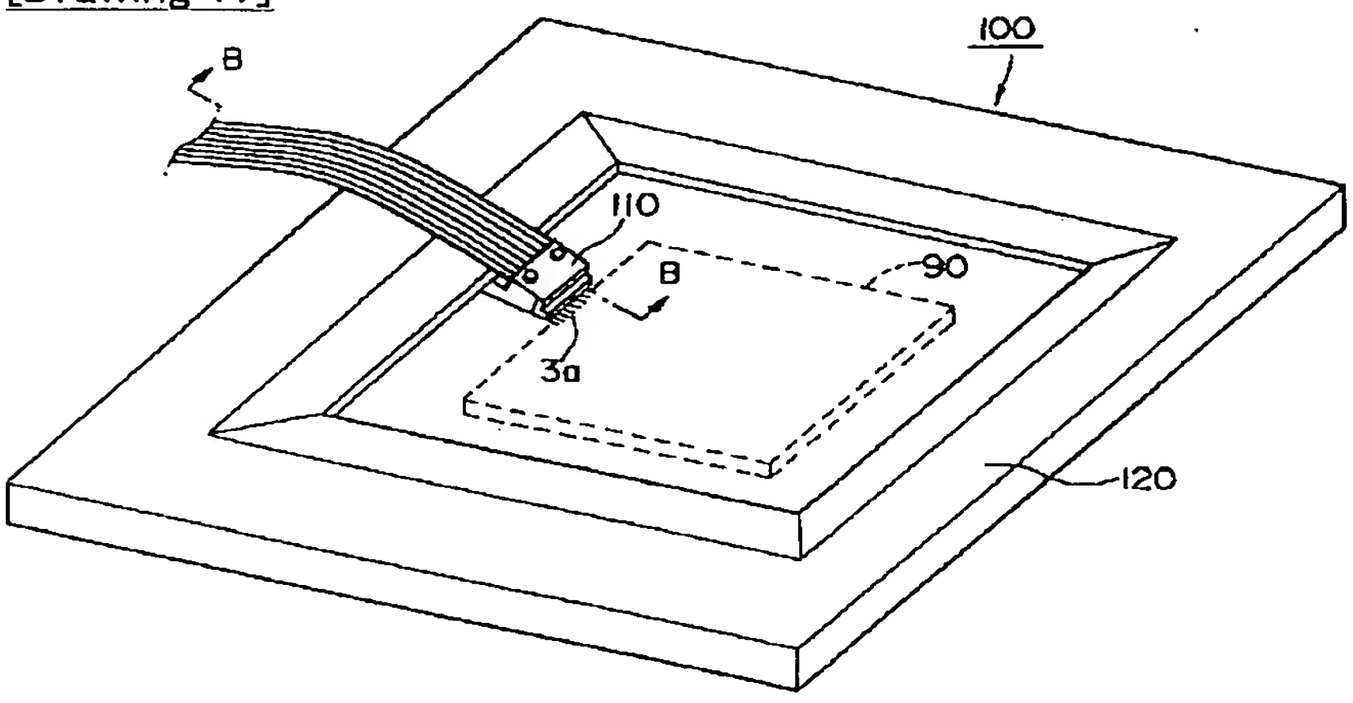


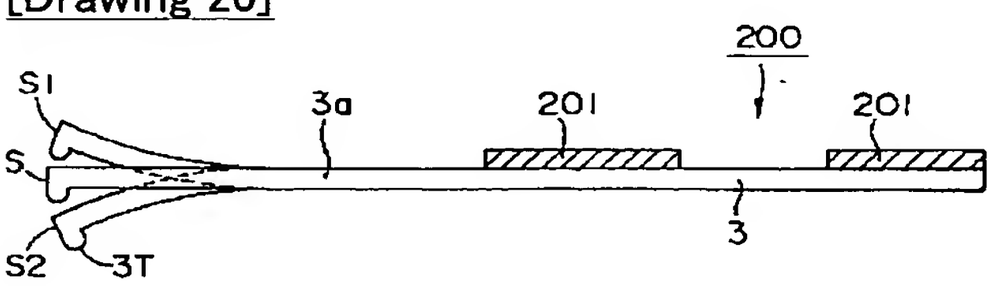
[Drawing 16]



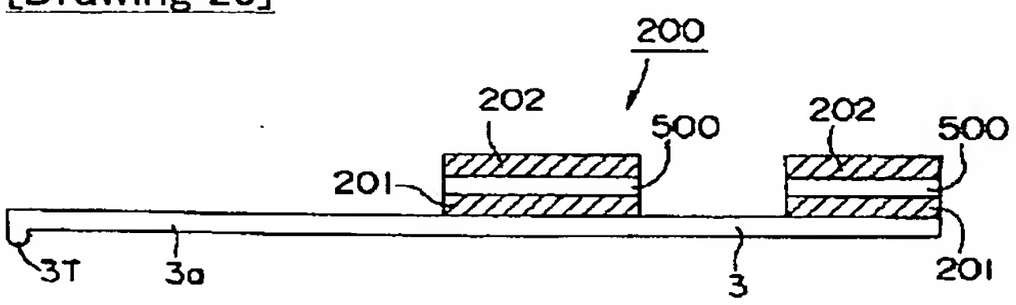
[Drawing 17]



[Drawing 20]



[Drawing 23]



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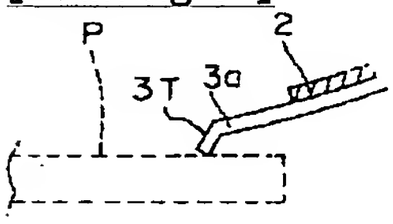

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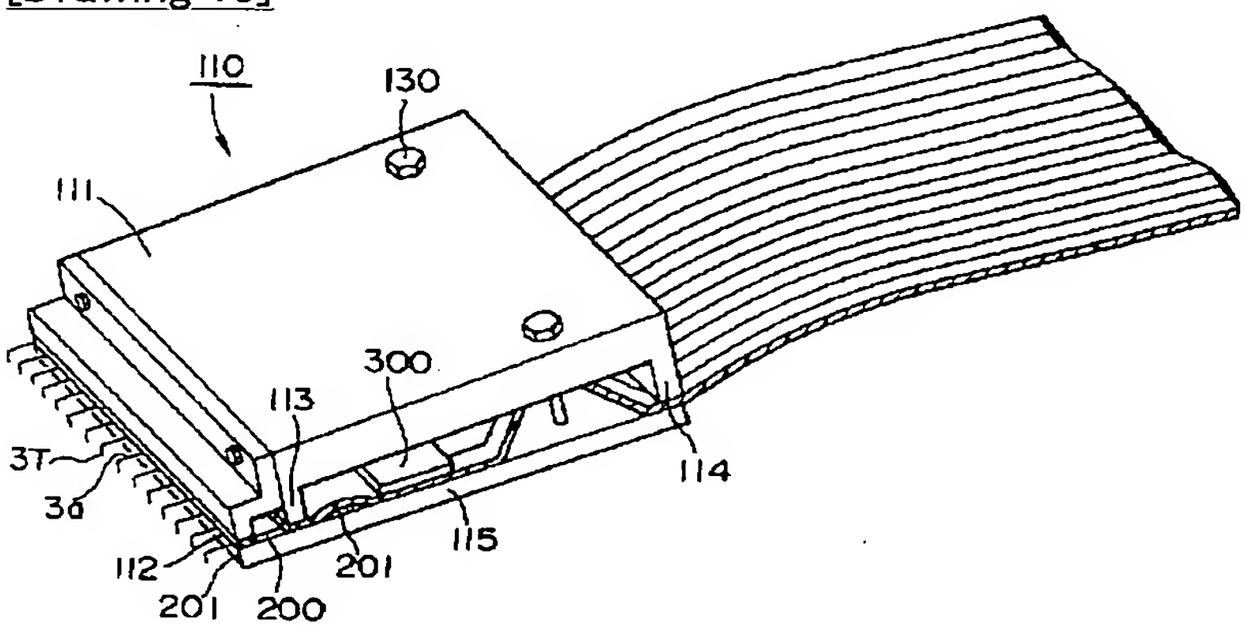

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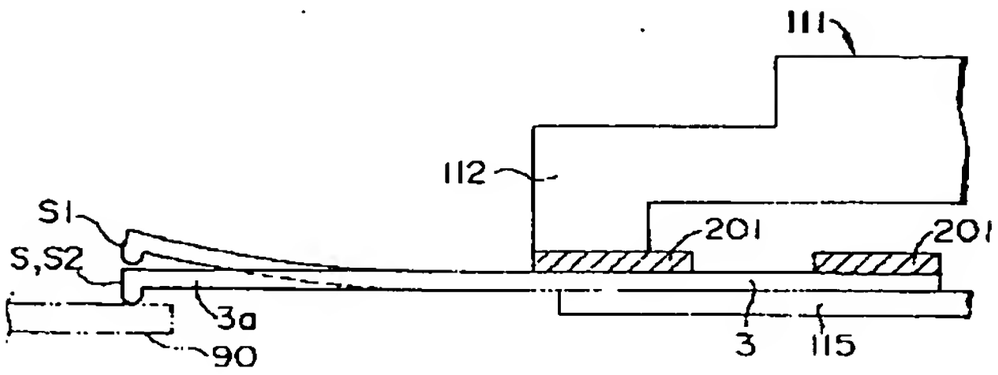

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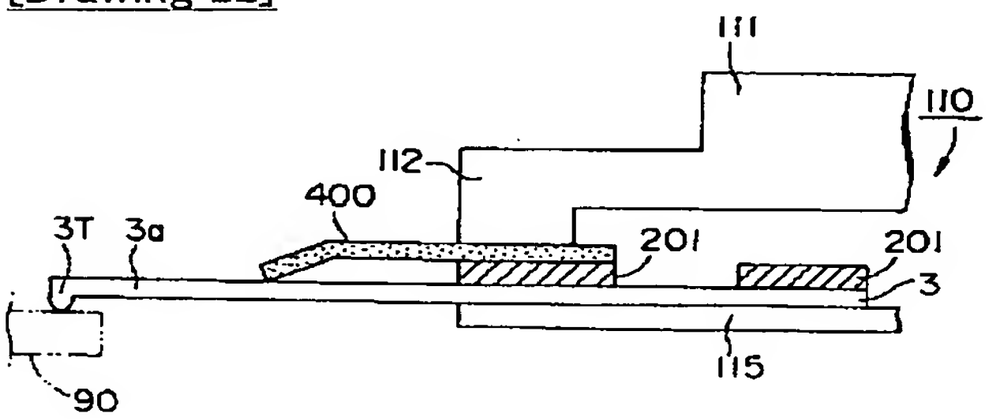

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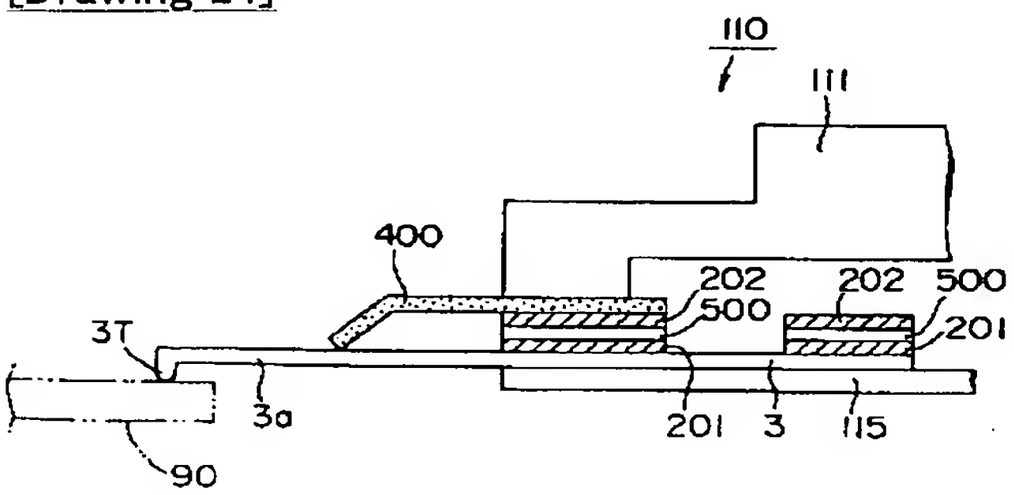

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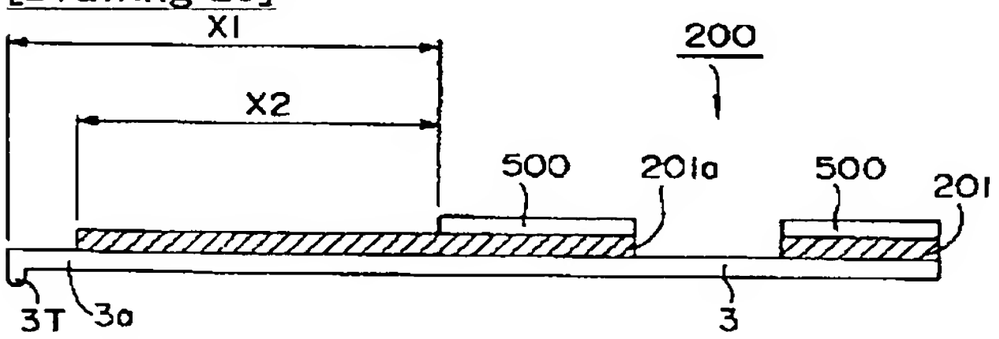

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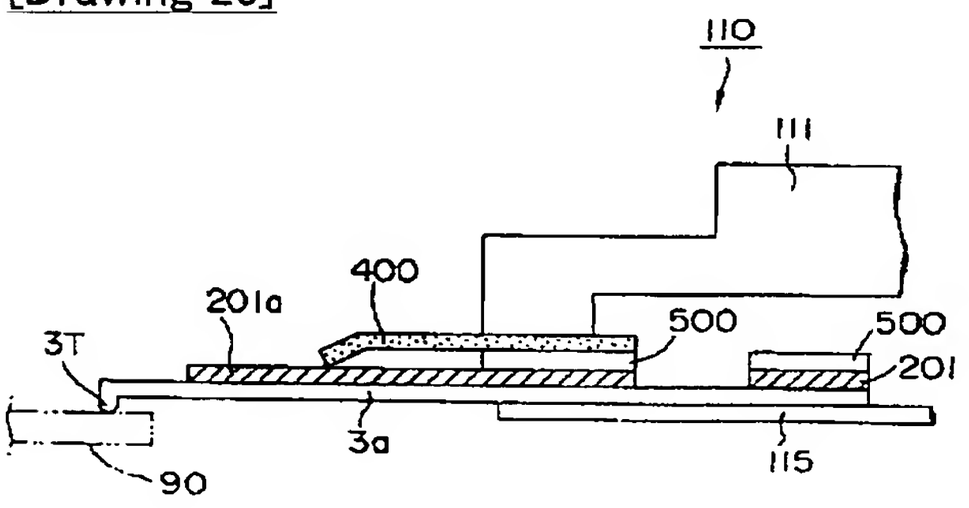

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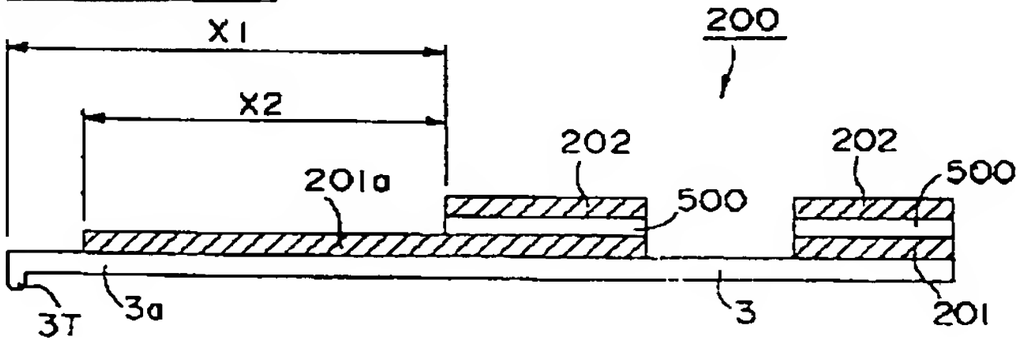

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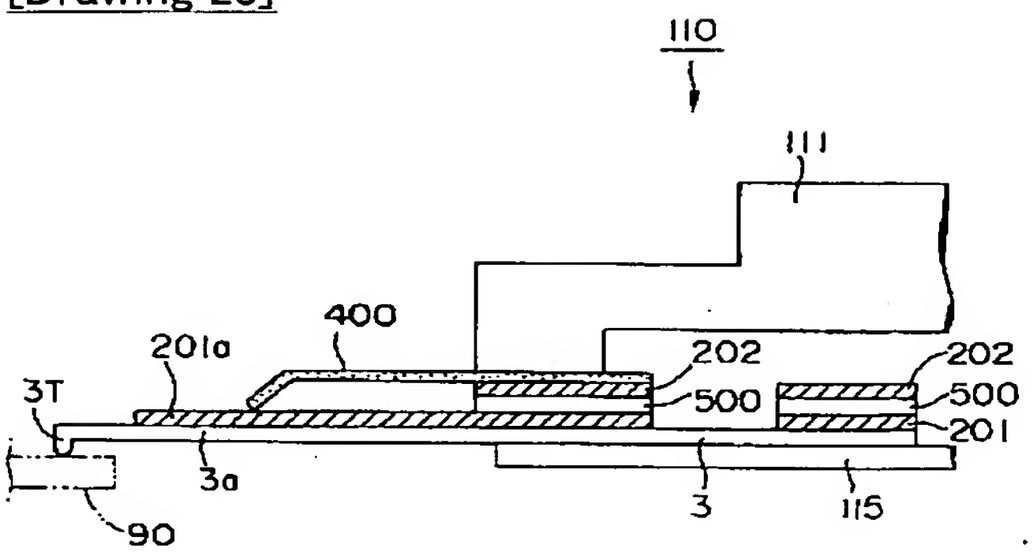

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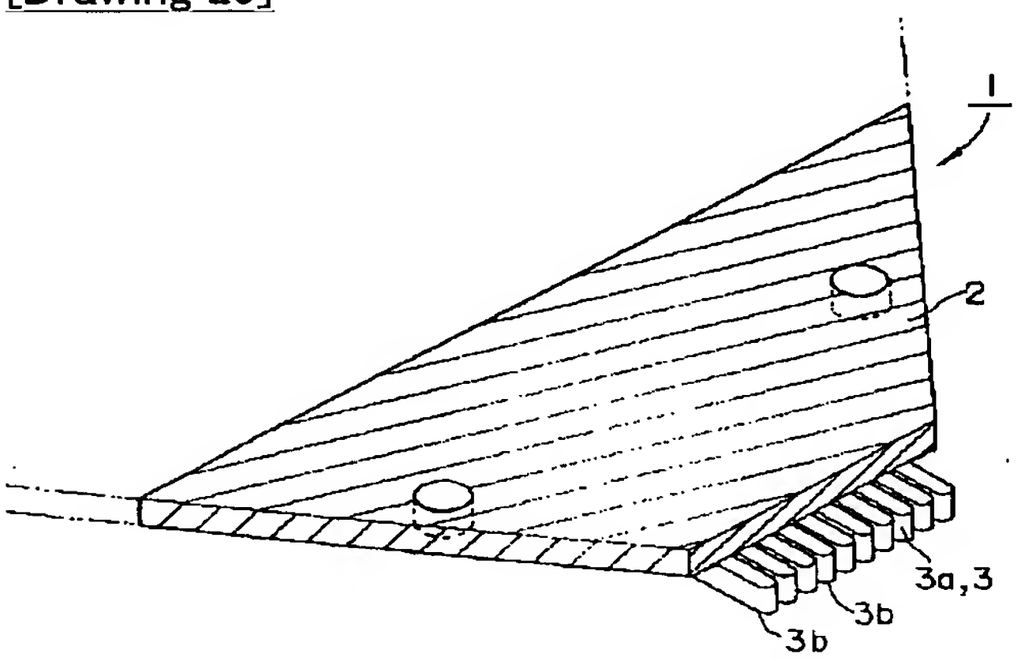

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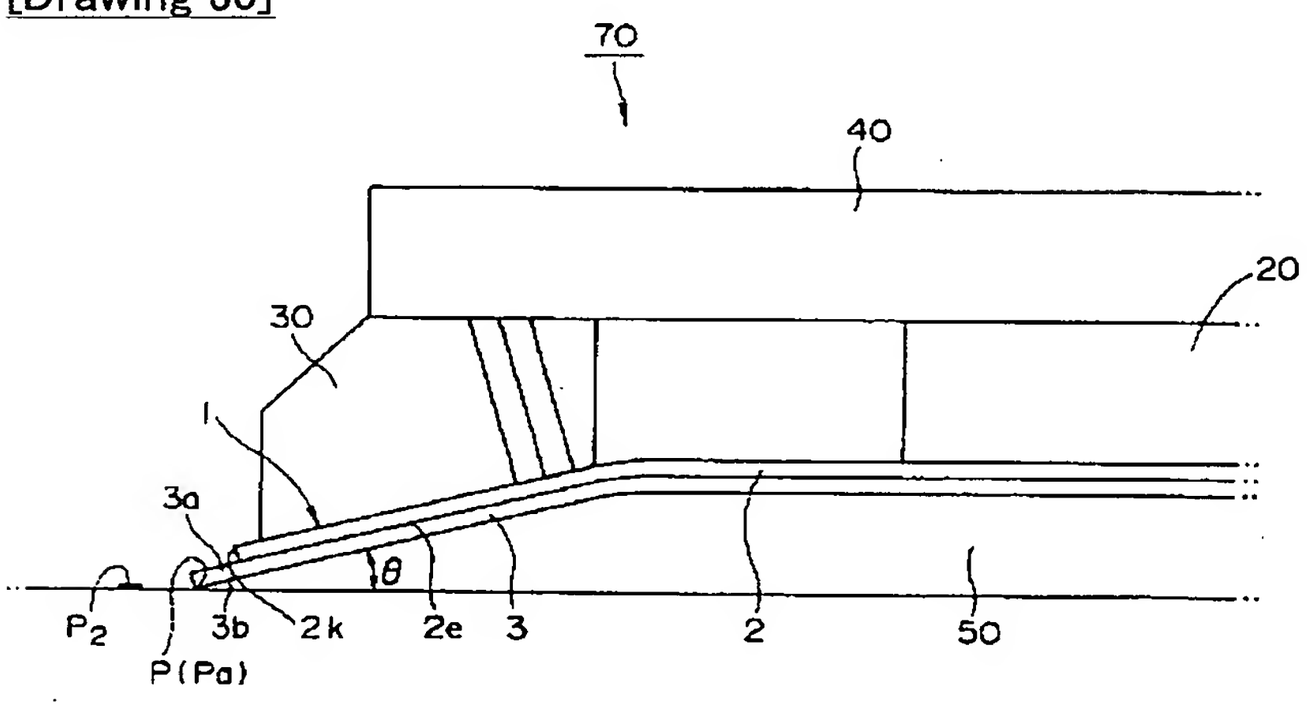

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